Idaho Forest, Wildlife and Range Policy Analysis Group

Report No. 21 December 2001

Endowment Fund Reform and Idaho's State Lands: Evaluating Financial Performance of Forest and Rangeland Assets

by

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Endowment Fund Reform and Idaho's State Lands:

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About the Policy Analysis Group (PAG)

Role and Mission. The Idaho Legislature created the Policy Analysis Group (or "PAG") in 1989 as a way for the University of Idaho to respond quickly to requests for information and analysis about current natural resource issues. The PAG's formal mission is to provide timely, scientific and objective data and analysis, and analytical and information services, on resource and land use questions of general interest to the people of Idaho.

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ACKNOWLEDGMENTS

The following individuals provided comments on a review draft of this report.

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* Dr. Jay O'Laughlin, senior author of this report, was privileged to serve as a member of this working group. Also on the working group, and not recognized above, was Robert M. Maynard, Public Employees Retirement System of Idaho (PERSI). Although he did not comment directly on a review draft, discussions with him were helpful in shaping ideas presented in this report.

Endowment Fund Reform and Idaho's State Lands:
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Short Summary

State trust lands, or "endowment lands" in Idaho, were granted at statehood from the federal public domain for the purpose of supporting public schools. The trust land management goal, as defined in the Idaho Constitution, is to provide "maximum long term financial return" to public schools and other beneficiary institutions. Management is made more difficult by the absence of an unambiguous and universally acclaimed indicator of performance. The rate of return on assets (ROA) is widely supported as a financial performance indicator, but calculation methods and appropriate standards or targets are somewhat ambiguous.

Financial Returns from Forests and Rangelands. The 994,000 acres of endowment forest land produced $62.7 million in timber-related net income in 2000, which was 93% of all income from endowment lands. More than 1.8 million acres are leased for grazing, providing $320,600 net income. Do forests and rangelands provide an adequate return on assets? The reply depends on the value of the land assets, and the performance target. Appraising endowment land asset value is problematic, as is selecting an appropriate standard to judge performance.

Land Asset Value Appraisal Method. Land expectation value (LEV) is a discounted cash flow technique for estimating the value of land that produces timber or forage. LEV relies on discounting anticipated future cash flows using an interest rate. Selection of an appropriate rate is a key policy decision. Simplicity would have the discount interest rate and performance target rate of return be one and the same. Analysis with a range of rates from 3% to 7% is appropriate until the asset manager (Idaho Department of Lands) and the trustee (State Board of Land Commissioners) have developed procedures and systems for evaluating financial performance.

Forest Land Performance. The value of forest land generally is determined by the timber growing potential of the land, the strategies for and investments in managing the timber growing stock inventory, the timber stumpage market, and the interest rate for guiding decisions. Using a 4% discount rate, the land expectation value (LEV) of timber production is $1 billion, and timber income ROA computes to 5.7%. At a 6% discount rate, LEV is $700 million, and timber income ROA is 8.5%. Each 1% increase in the discount rate increases timber income ROA by 1.5% because LEV is decreased. Before a policy decision on the appropriate interest rate is made, the effects on timber stand management need careful consideration. The higher the interest rate, the earlier trees will be cut. Current cutting ages of 80+ years imply a management decision guide of less than 2%.

Rangeland Performance. The value of endowment land for grazing is related to the fair market value of forage, not the grazing fee set to determine how much ranchers pay for grazing leases. The grazing fee is widely recognized as below forage market value, making LEV computation problematic. Economists say public land forage leases are worth roughly 30% less than private lease rates because fewer services are provided. This computes to a grazing fee roughly 50% higher than the current endowment land fee. Using this valuation approach, grazing income ROA computes to 1.1% with an estimated fair market LEV for forage production of $26 million at a 4% discount rate. At a 6% discount rate, the LEV is $17 million and grazing income ROA is 1.6%. Each 1% increase in the discount rate increases grazing income ROA by 0.3% because LEV is decreased.

Improving Underperformance. If land parcels are not meeting the target, the first thing to do is reconsider whether the target is appropriate for that land classification, and if not, change it. Selling or exchanging land is an option for reducing management costs. Sales are constitutionally limited to 100 sections or 64,000 acres per year. Modifications in management policies or practices may improve financial performance. Forest land ROA performance of 4% to 9%, varying by discount rate and the timber stumpage market in a given year, may be enhanced by changing management practices. Options include reducing the cutting age from 80+ years to 55-70 years, and investing in thinning, fertilizing, and planting. Rangeland ROA performance of 1% to 2%, varying by the discount rate, may be increased by changing grazing lease policies. Options include increasing the grazing fee, and/or encouraging competitive bidding for leases. In general, the "maximum long term financial return" goal of the Idaho Constitution could be attained more effectively if managers viewed land as a *fiscal*, not *physical*, asset.

Executive Summary

Idaho, like other states, was granted lands from the federal public domain at statehood for the purpose of providing financial support to public schools. Since statehood, more than one million acres of the original grant lands have been sold. Today there are 2,462,621 acres of "endowment lands" managed as a trust by the Idaho Department of Lands (IDL) under the policies and guidance of the trustees, the Idaho State Board of Land Commissioners (Land Board). The Idaho Constitution sets the management goal for endowment lands as providing "maximum long term financial return" to the trust beneficiaries, which are the public schools and eight other public institutions.

Objectives. The goal of this report is to evaluate Idaho's endowment trust land assets and asset management with appropriate indicators of financial performance. Specific objectives are:

- Review the changes in Endowment Fund management that have heightened concern for financial performance of land assets (**Part 2**).
- Select appropriate financial performance indicators for forest lands and rangelands (**Part 3**).
- Appraise the value of endowment forest lands and rangeland assets, and then measure the return on asset value provided by current IDL operations (**Parts 4 and 5**).
- Discuss managerial flexibility in the context of the Idaho Constitution's goal to provide "maximum long term financial return" to the trust beneficiaries (**Part 6**).
- Analyze alternative approaches for managing underperforming land assets (**Part 7**).

Part 2. Background and Context: Endowment Land Assets and Endowment Fund Reform. Endowment land assets include almost one million acres of forest lands. Almost half of these are high- or medium-productivity lands. Since 1992 forest lands have provided more than $50 million net income each year, or 93% of the financial return derived from endowment lands. More than 1.8 million acres of endowment lands are leased to private operators for grazing livestock, providing since 1992 an average of more than $400,000 net income per year.

Gross revenues from land assets flow into an Earnings Reserve Fund from which distributions are made for expenses and payments to beneficiaries are disbursed. Some portion of net revenues becomes part of the Public School Permanent Endowment Fund, now valued at roughly $800 million in assets such as stocks and bonds, from which interest and earnings are distributed through the Earnings Reserve Fund to trust beneficiaries.

Until recently, the Idaho Constitution limited investments of the Permanent Endowment Fund to low-risk low-return government bonds. Constitutional amendments in 1998 and 2000 created flexibility to invest in other assets, such as common stocks, to produce more income for the beneficiaries. The implications of Endowment Fund reform on land and resource management stem from renewed attention to the financial performance of land assets. A full set of performance measures can help answer questions about the management of trust land assets.

A Citizens' Committee assembled in 2001 by the governor recommended that IDL develop an "investment plan." It could include the elements of what the Western States Land Commissioners Association calls an "asset management plan"—a statement of policies, a land asset classification system, and a financial and economic performance analysis. Economic analysis adds environmental and social criteria and indicators of performance to financial analysis so that trust land assets are protected and enhanced for future beneficiaries. Environmental and social performance indicators are considered herein, but by design this report focuses primarily on financial measures appropriate for evaluating Idaho's endowment forests and rangelands.

Part 3. Financial Performance Evaluation Methods. Trust land asset performance evaluation begins with discounted cash flow techniques common to any other investment analysis. Financial returns are derived from the sale or lease of monetary values of the physical products of the land, i.e., timber and forage, minus the costs of land management. The stream of net income for each year within the relevant time horizon is discounted to the present using a "guiding" or "target" interest rate.

Selection of the appropriate guiding interest rate is an important policy decision. Not only is the interest rate used to discount cash flows, it also provides a benchmark for judging performance. In addition the choice of interest rate makes a statement about how trust managers value the future in relation to the present. The higher the target rate, the less value future events have. Public agencies therefore generally use a lower discount rate than private

organizations, who most often use their cost of capital, adjusted for financial risk. An alternative rate of return from other uses of funds, such as investments in triple-A corporate bonds, is the appropriate concept.

Discounted cash flow provides an estimate of the net present value of an investment. When the cash flows are derived from land use and resource management activities that are assumed to be perpetual, the net present value (NPV) of future cash flows is called the land expectation value (LEV). The LEV is an *income capitalization* technique for appraising land asset values when data on *comparable sales* of similar properties are not available.

"Total return" is the appropriate approach to performance evaluation. It includes not only net income realized from land management activities but also the unrealized change in land asset value, which is the change in LEV from one year to the next. To determine the rate of return on asset value, the total return is divided by the previous year's LEV.

The "maximum long term financial return" goal of the Idaho Constitution could be attained more effectively if managers viewed land as a *fiscal*, not *physical*, asset.

Part 4. Forest Land Asset Valuation. Forests are a store of wealth or capital as well as the source of many non-monetary values. The monetary value of a forest is in *land* and *timber*, and is increased by the biological growth of trees and by the value of timber "stumpage" in markets where prices change through the interaction of supply and demand factors.

Idaho endowment forest lands include approximately 450,000 acres of sites classified as high- or medium-productivity. These forests could provide 4% annual timber growth per year. In addition, inflation-adjusted "real" prices in regional stumpage markets are projected to increase an average of 1% per year over the next 50 years.

Land asset performance is highly dependent upon the valuation of the land asset. What is land worth for growing timber? Foresters solved this problem 150 years ago with a discounted cash flow technique called land expectation value (LEV). The LEV assumes a series of identical cash flows will be produced in perpetuity; the series can be annual, or on a periodic basis. Large tracts of timber, such as Idaho endowment lands, can be evaluated as one forest management entity by considering annual net income, even though individual stands or parcels of land do not provide timber harvests each year. In 2001, using a 4% discount rate, the appraised value of Idaho endowment forest lands is an LEV of approximately $932 million. In 2000, it was $1.24 billion, up from $1.02 billion in 1999. The LEV is very sensitive to the discount interest rate and timber stumpage market price changes.

Return on Asset Value–Forest Land. Total return on assets was 0.6% in 1999, 28.0% in 2000, and –20.6% in 2001. Between 1999 and 2001, endowment forest lands provided net income that has declined from $66 million to $52 million. The changes in land value, calculated at a 4% guiding rate, provided unrealized gains/losses of –5.6%, 21.8%, and –24.8% in the three years analyzed. The return on assets from timber income at a 4% target rate was 6.2% in 1999, 6.2% in 2000, and 4.2% in 2001.

Sensitivity analysis indicates that a higher interest rate used to calculate LEVs would result in a higher return on asset value because the LEV would be lower. Each 1% increase in the interest rate adds 1.5% to the return on assets from timber income. Before a guiding or target interest rate is selected, the effects on timber resource management need to be considered. The higher the interest rate, the earlier trees will be cut. A target rate of 4% is likely to result in cutting ages of 55-70 years on high- and medium-productivity sites. Current cutting ages of 80+ years imply the use of a guiding interest rate of less than 2%. On low-productivity sites a 4% target rate is not attainable unless the cutting age is 80+ because of timber growth characteristics, with low harvest volume.

Rate of Inventory Turnover. Analysis of the rate of inventory turnover shows endowment lands are currently managed with a timber strategy intermediate between federal lands and private lands. Reducing the cutting age on endowment lands would turnover the timber inventory faster, providing a higher present value of long-term income for the Endowment Fund. The "maximum long term financial return" goal of the Idaho Constitution could be attained more effectively if managers viewed land as a *fiscal*, not *physical*, asset.

Part 5. Rangeland Asset Valuation. Rangelands are a capital asset, as well as the source of many non-monetary values. The monetary value of range is in *land* and *forage* for grazing livestock. Forage is measured in "animal unit months" (AUMs). One

cow in one month consumes one AUM of forage. Under the Land Board's guidance, IDL sets prices for forage using a formula similar to that of federal agencies, with adjustments resulting in a price per AUM ($4.75 in 2000) between prices for federal ($1.35) and private ($10.90) forage. Studies indicate that public land grazing fees are set below the fair market value of forage, which would be about 70% of the private market value, or $7.63 in 2000.

Idaho endowment rangeland grazing leases in 2000 provided net income of $320,000 on revenues of $1.3 million. The LEV provides an estimate of the forage income-producing component of rangeland. Rangeland appraisal is problematic because forage prices are set administratively rather than in a market. For fair market value appraisal purposes the endowment land grazing fee of $4.75 per AUM was adjusted upward to $7.63. Discounted at 4%, the future attainable cash flows from grazing result in a fair market LEV of $27.6 million in 1998, $25.6 million in 1999, and $25.9 million for 2000.

Return on Asset Value–Rangeland. Total return on assets was 7.0% in 1998, –6.4% in 1999, and 2.4% in 2000. The changes in land value, calculated at a 4% discount rate, provided unrealized gains/losses of 5.9%, –7.3%, and 1.1% in the three years analyzed. The return on assets from grazing income averaged 1%, with 1.1% in 1998, 0.9% in 1999, and 1.3% in 2000. Sensitivity analysis indicates that a higher target or discount rate would result in a higher return on asset value because the LEV would be lower. Each 1% increase in the interest rate adds 0.3% to return on assets from grazing income.

Annual timber returns of 4% to 9% may be increased by different management strategies. Annual grazing returns of 1% to 2% may be increased by changing grazing fee policies.

Part 6. How flexible is the "maximum long term financial return" mandate? The Idaho Constitution states that endowment lands are to provide "maximum long term financial return" to public schools and other designated beneficiaries. Flexibility is evident in management decisions to protect scenic viewsheds by modifying timber harvest plans, as at Priest Lake, and by pricing grazing leases at less than the fair market value of forage.

Financial criteria are only one part of a performance evaluation. In addition to cash income and expenditures are opportunity costs of foregone options, indirect costs of environmental impacts and protection strategies, and social and cultural costs of changing the expectations and lifestyles people derive from the endowment lands. Environmental and social criteria also need consideration. Nevertheless the level of "maximum long term financial return" from state trust lands needs be determined so that trust beneficiaries know the opportunities foregone by selecting one management option instead of another. Opportunity costs work both ways. In some situations financial values from timber sales and/or grazing leases may be less than the non-financial benefits foregone. After a range of performance criteria and indicators has been considered, it is conceivable that financial returns could be increased above current levels by considering different management options.

Part 7. Improving Financial Performance. If some lands are underperforming expectations established by performance indicators, parcels can be sold, exchanged, or managed differently. Or the performance measures can be adjusted. Annual timber returns of 4% to 9% (Table 1) may be increased by different management strategies: reduce the timber cutting age, using the target rate of return as a guide; and invest in thinning, fertilizing, and planting. Annual grazing returns of 1% to 2% (Table 1) may be increased by changing grazing fee policies: increase the grazing fee to fair market value and encourage competitive bidding for grazing leases. Management costs could be reduced by consolidating holdings.

If they exist, environmental and/or social performance shortcomings would also indicate a need to change management strategies, perhaps by creating new land classifications that are not expected to meet the "maximum long term financial return" mandate because other values expressed as opportunity costs may be more important. Examples would be forest lands in scenic viewsheds, low-productivity forest lands, and rangelands where grazing may affect sensitive plant or animal species.

In the end, financial performance criteria have limited utility in comparing endowment trust land assets to other financial assets. An acre of Idaho forest or rangeland just is not the same thing as shares of stock in a corporation, because land provides environmental and social values as well as financial return for the beneficiaries. Policy decisions that guide trust land managers have been, and likely will continue to be, a balancing of financial, environmental, and social concerns.

Table 1. Financial performance indicators, Idaho endowment forest land, 1999-2001, and rangeland, 1998-2000.

Forest Land	**FY 1999**	**FY 2000**	**FY 2001**	**Average**
Net income*	$66,426,300	$62,664,300	$52,225,400	$60,438,667
Change in net income (year-to-year %)*	9.3%	-5.7%	-16.7%	-4.4%
Cash expenditures as % of cash income*	11.9%	13.5%	14.5%	13.2%
Expected net income from timber#	$40,701,200	$49,590,800	$37,276,000	$42,522,667
Land expectation value (LEV) @ 4%£	$1,017,530,000	$1,239,770,000	$931,900,000	$1,063,066,675
Return on assets, timber income (ROA_T)	6.2%	6.2%	4.2%	5.7%
Return on assets, land value change (ROA_L)	-5.6%	21.8%	-24.8%	-8.6%
Total return on assets (ROA_{T+L})*	0.6%	28.0%	-20.6%	-2.9%
Land expectation value (LEV) @ 6%£	$678,353,333	$826,513,333	$621,266,667	$708,771,117
Return on assets, timber income (ROA_T)	9.2%	9.2%	6.3%	8.5%
Return on assets, land value change (ROA_L)	-5.6%	21.8%	-24.8%	-8.6%
Total return on assets (ROA_{T+L})*	3.7%	31.1%	-20.6%	-0.1%
Rangeland	**FY 1998**	**FY 1999**	**FY 2000**	**Average**
Net income*	$282,200	$237,100	$320,600	$279,967
Change in net income (year-to-year %)*	-34.2%	-16.0%	35.2%	-5.0%
Cash expenditures as % of cash income*	75.8%	81.5%	75.5%	77.6%
Idaho state land grazing fee, $ per AUM	$4.16	$4.72	$4.75	$4.54
Fair market value grazing fee, $ per AUM§	$7.56	$7.77	$7.63	$7.65
Attainable net income from grazing#	$1,104,489	$1,024,106	$1,035,764	$1,053,755
Land expectation value (LEV) @ 4%£	$27,612,231	$25,602,650	$25,894,100	$26,343,879
Return on assets, grazing income (ROA_G)	1.1%	0.9%	1.3%	1.1%
Return on assets, land value change (ROA_L)	5.9%	-7.3%	1.1%	-0.1%
Total return on assets (ROA_{G+L})*	7.0%	-6.4%	2.4%	1.0%
Land expectation value (LEV) @ 6%£	$18,408,154	$17,068,433	$17,262,733	$17,562,585
Return on assets, grazing income (ROA_G)	1.6%	1.3%	1.9%	1.6%
Return on assets, land value change (ROA_L)	5.9%	-7.3%	1.1%	-0.1%
Total return on assets (ROA_{G+L})*	7.5%	-6.0%	3.0%	1.5%

Abbreviations: AUM = animal unit month.

* Financial performance indicators recommended to the Western States Land Commissioners Association in a consulting firm's report (AIS 2000).

Net income used to calculate land expectation value (LEV); for timber, it is the expected value of the long-term sustained-yield annual timber harvest times the current year's timber stumpage bid price; for grazing, it is attainable value of annual income, which is AUMs in the current year times an estimate of the fair market value grazing fee.

£ Land expectation value (LEV) is the present value of perpetual series of net incomes at a selected interest rate; this *income capitalization* real estate appraisal technique can be used with either periodic or annual income streams.

§ As suggested by Bartlett et al. (2001), "Valuing public land forage," *Journal of Range Management.*

Source: Table 4-10 for forest land, Table 5-4 for rangeland.

Part 1. Introduction

> **The management of public lands is a thankless task, made more difficult by the absence of an unambiguous and universally acclaimed indicator of performance.**
>
> – D.W. Bromley (1984), in *Developing Strategies for Rangeland Management*

The task before us is to develop indicators of financial performance for Idaho's endowment trust lands so that progress toward the goal of "maximum long term financial return" to trust beneficiaries can be evaluated. As the above quotation suggests, this is a necessary but difficult undertaking.

Recent reform of Endowment Fund management by constitutional amendment has heightened interest in financial performance, with implications for land management. Reform has created flexibility to earn higher rates of return from the financial assets in the Endowment Fund asset portfolio. Trust assets also include more than 2.4 million acres of endowment lands managed by the Idaho Department of Lands. Reform has, in turn, generated additional pressure to increase monetary returns from land assets (Wiggins, review comments).

Goal. The goal of this report is to evaluate endowment trust land assets and asset management using return on asset value to gauge financial performance. Specific objectives are identified below.

Organization and Objectives. The outline and objectives for this report were developed during discussions with the PAG's Advisory Committee (see inside cover) regarding how Endowment Fund reform might impact state endowment lands, and what information might be useful to policymakers. The primary audience is the Idaho State Board of Land Commissioners (Land Board). Information herein may also be useful to others interested in management of state lands, including the Idaho Legislature and citizens interested in forest and range management issues.

Each major part of the report could stand alone and ends with a summary and conclusions section. This creates some redundancy between one part and another, but is useful for those who will not read the report from cover to cover.

Part 2 reviews the changes from Endowment Fund reform as background and context for renewed concern about land asset performance and implications for forest and rangeland resource management.

Part 3 selects appropriate financial performance criteria and indicators for forest lands and rangelands. It is a primer on financial analysis concepts and methods and their application to land and resource management decisions. Discounted cash flow techniques are defined and described, as are different methods for appraising the value of land assets. Return on assets (ROA) is the dominant financial performance measure. ROA is derived from two sources: net income and asset appreciation (AIS 2000). ROA can be used to identify land assets that are "underperforming" in the financial sense, a term of reference used by the Idaho Department of Lands (IDL 2000b).

The "target" rate of return is a key policy decision the Land Board faces. This interest rate is used not only to judge financial performance, but also to quantify the balance between short- and long-term outlook that affects asset management decisions, especially forest management with its long-term production period. The higher the interest rate, the less weight managers give to long-term considerations, including when to harvest timber.

Methods of appraising the value of and returns to forest and rangeland asset management are provided in **Part 4** and **Part 5**, respectively. These measurements can be used to gauge the performance of forests and rangelands as components of the Endowment Fund asset portfolio.

These financial analysis concepts have been developed in the context of time series data for publicly traded security markets, thereby making the analysis more precise and useful (AIS 2000). Noteworthy is the acquisition in the 1990s of roughly $7 billion in timberlands by institutional investors such as pension funds (HTRG 2001). The investment horizon of institutional investors is relatively short, and their management strategy may not be appropriate for the long term (Wiggins, review comments).

Part 6 discusses briefly the flexibility trustees (i.e., the Land Board) and managers (i.e., the Idaho Department of Lands) have under trust law. **Part 7** identifies alternatives for improving situations where lands may be underperforming, including forest management strategies, grazing lease policy, and the sale or exchange of land.

Part 2. Background and Context

The trust land concept is woven deeply into our nation's heritage (WSLCA 2001a). In 1785 the Articles of Confederation established the school lands program, and the dedication of lands in each township to support public schools and the right of education for all people. This fundamental concept began the legacy whereby the Union assisted new states by giving them lands to support education and other essential public services. Lands were given at statehood for these purposes and to compensate states for their pledge not to tax federal lands within the state boundary. This constituted a contract between Congress and each of the new states that the lands be managed for identified objectives and beneficiaries (WSLCA 2001a). Today these grant lands are managed as a trust in Idaho and more than 20 other states (Souder and Fairfax 1996).

2.1. Trust Land Management

The federal government granted lands to the states to provide a system for supporting public institutions. Idaho, like other states, manages its grant lands as a trust to benefit public schools and other public institutions. State trust lands are called endowment lands in Idaho, and represent 4.6% of the state covering 2,462,621 acres (Table 2-1). Approximately 85% of these lands belong to the Public School Permanent Endowment Trust Fund, with the rest belonging to eight other institutions (IDL 2000a).

Timber provided $62.7 million net income, or 93% of all endowment land net income in 2000. Costs of $9.7 million were 13% of $72.4 million in gross revenues. Net income was $83 per acre of primary forest lands or $63 per acre from all forest lands. Grazing provided $320,600 net income, or 17 cents per acre of rangeland. Costs of $986,300 were 75% of $1,306,900 gross revenues.

Information on the economic use (or "asset classification") of endowment lands by areas of the state is provided in Table 2-1. Some of the lands are in more than one asset classification because of multiple uses of the land (IDL 2000a). These lands include 758,112 acres of primary forest land managed for timber production (IDL 2001b) and a total of 1,837,658 acres leased for grazing (IDL 2000a). This report focuses on forest and rangeland asset classes. The sum of forest land and rangeland exceeds the total acreage of endowment lands because some forest lands are also leased for grazing.

Returns from the endowment lands include net income from all sources relating to their management, including timber sales, timber sale interest, land sales, land sale interest, cropland and grazing lease fees, cottage recreational site lease fees, commercial lease fees, and other special lease and maintenance fees (IDL 2000a).

This report is concerned with measuring the financial performance of timber sale and grazing lease programs. Basic statistics are as follows. Timber provided $62.7 million net income, or 93% of all endowment land net income in 2000. Costs of $9.7 million were 13% of $72.4 million in gross revenues. Net income was $83 per acre of primary forest lands or $63 per acre from all forest lands. Grazing provided $320,600 net income, or 17 cents per acre of rangeland. Costs of $986,300 were 75% of $1,306,900 gross revenues (Table 2-1, acreage data; IDL 2001b, revenue and expense data).

2.2. Trust Revenue Sources

A trust is a system for producing revenue for designated beneficiaries (Souder and Fairfax 1996). It consists of three parts: management, the trust properties or assets (sometimes called the "corpus"), and the revenues produced by managing the corpus. The trust corpus includes the trust land base and the state's various endowment funds. The Endowment Fund (Figure 2-1) consists of the Public School Permanent Endowment Fund and other corpus funds, i.e., the Earnings Reserve Fund, Income Fund, and Land Bank Fund. Like other states, the Idaho Constitution elaborates on how endowment funds may be invested.

The Endowment Fund receives an annual stream of revenue from endowment lands, resources and other investments (Figure 2-1). Land sale revenues are placed into the Land Bank Fund for land acquisition or, after a period of time, into the Endowment Fund. The Permanent Endowment Fund directly receives revenue from mineral royalties. The Earnings Reserve Fund receives revenue from timber sales and grazing leases, cottage site leases, agricultural leases, commercial real estate, and special use leases.

Table 2-1. Idaho endowment land acres by administrative area and economic use or asset class.

Administrative Area	Primary Forest Land	Secondary Forest Land	Cropland	Rangeland	Recreation/ Cottage Site	Other	Total
Priest Lake	103,786	65,364	---	977	189	14,768	185,714
Pend Oreille	89,926	13,131	63	7,703	---	26	104,243
St. Joe	129,788	20,962	---	24,598	25	266	160,050
Clearwater	248,312	19,325	61	209,749	---	270	292,951
Payette Lakes	88,179	15,438	98	148,865	107	3,336	188,907
Southwest	58,976	9,850	576	474,220	---	1,537	501,321
South Central	---	12,054	1,524	283,924	---	7,375	304,730
Eastern Idaho	39,145	79,947	11,081	687,618	496	5,846	724,705
Total	758,112	236,077	13,406	1,837,658	817	33,428	2,462,621

Sources: Idaho Department of Lands (2000a, 2001a).

2.3. Endowment Fund "Reform"

Before 1998, the Idaho Constitution required that the Endowment Fund assets could only be "loaned." This effectively limited the fund portfolio to vehicles that guaranteed repayment of principal; more specifically, fund managers were limited to government bonds. Endowment Fund "reform" began in 1998, when Idaho citizens voted to amend the Idaho Constitution to create flexibility for management of the renamed Public School Permanent Endowment Fund. In 2000 voters were asked to iron out a technicality in the 1998 amendment (IDL 2000b). Voters approved the 1998 and 2000 amendments. **Appendix A** includes the pertinent sections of the Idaho Constitution, before and after the amendments.

The sources of revenues for the Endowment Fund and the management and distribution of funds is illustrated in Figure 2-1. All revenues from natural resources flow into the Earnings Reserve Fund, except mineral royalties which go directly to the Public School Permanent Endowment Fund (Saums, review comments). Unrealized gains in asset value are put into the Earnings Reserve Fund annually, and unrealized losses are taken annually against the corpus and Earnings Reserve Fund based on the proportional fund balance at year end (Saums, review comments).

Three principal features of Endowment Fund reform, with some general implications, follow:

1. ***Endowment Fund.*** The fund manager, the Endowment Fund Investment Board, is no longer restricted to only government bonds. The general implication is that higher investment returns will come to the Endowment Fund, but attendant with that is higher risk.

2. ***Earnings Reserve Fund.*** Most of the revenues produced by fund assets are deposited here before distribution to the Endowment Fund, Public School Permanent Endowment Fund, or Income Fund (Figure 2-1).

3. ***Land Bank Fund.*** This was created to hold proceeds from the sale of lands for a period of time to be specified by the legislature, after which the proceeds and whatever interest has been earned are either reinvested in another parcel of land, or are "returned to the Public School Permanent Endowment Fund for long-term investment" (Idaho Constitution, Art. IX, sec. 4, see **Appendix A**). Although land sales are still restricted by the Idaho Constitution to 100 sections per year, fund managers can use land sale proceeds to invest in commercial real estate, equity stocks, or any other investment they feel is prudent (Figure 2-1).

Appendix B provides the specific questions the constitutional amendments addressed, as they were put to citizens on the ballots in 1998 and 2000. Also included in **Appendix B** is a review of the issues associated with Endowment Fund reform as prepared by the Legislative Council and presented to voters in the form of statements for and against the amendments. **Appendix C** provides statutes in the Idaho Code that pertain to endowment lands.

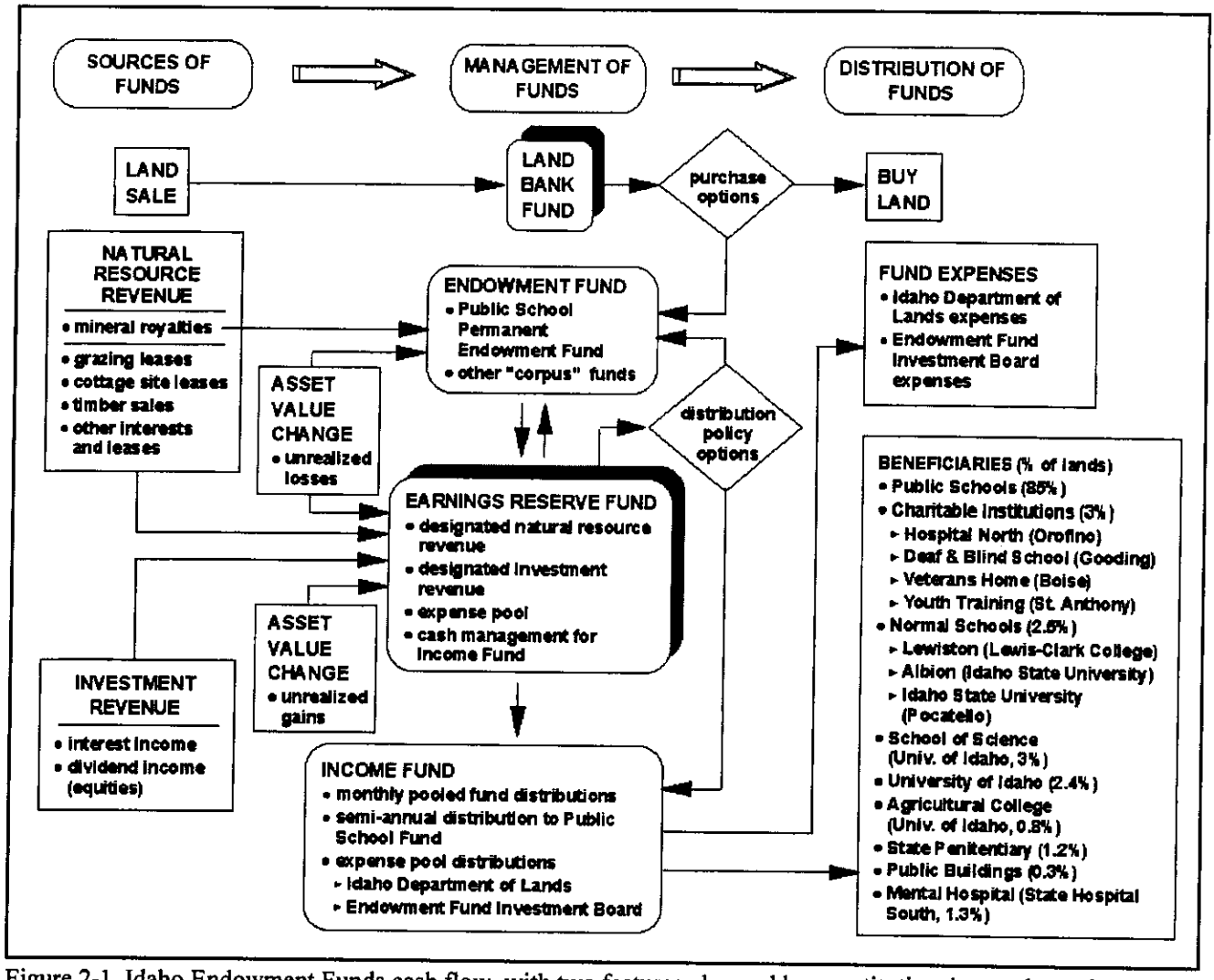

Figure 2-1. Idaho Endowment Funds cash flow, with two features changed by constitutional amendment in 2000 highlighted in shadowed boxes.

2.4. Issues and Implications

Endowment Fund reform raises many issues. The combined effect of Endowment Fund reform has implications for the management of endowment lands. Is it prudent to sell the lands and reinvest the proceeds? This is not a new question:

> I say that neither I nor you have any definite idea what this land is worth today which lies under the sun of Idaho or what it is going to be worth in the future.
>
> – Mr. Parker, *Idaho Constitutional Convention Proceedings*, 1889

> These school lands should remain to perpetuate the school fund, preserving a nucleus around which we may collect something for not only ourselves who live now, but for those who shall come after us.
>
> – Mr. Vineyard, *Idaho Constitutional Convention Proceedings*, 1889

To Mr. Parker, one could say today that it is possible to definitively say what these lands are worth for producing income, as we do in **Part 4** for forest land and **Part 5** for rangeland. However, he was right about the future. The value of these lands is unknown. What may have appeared to be infinite a century ago is now recognized as finite (WSLCA 2001a). With population growing rapidly in the West and public services' infrastructure and capacity challenged, demands for available lands, natural resources, revenue, and locations for public

recreation and other activities also rapidly increase (WSLCA 2001a).

To Mr. Vineyard, one could say that perpetuating the school fund with a nucleus of lands is a good idea, but the ideal size of that nucleus is unknown. History shows Idaho has reduced the acreage of the original 3.5 million acres of grant lands by more than one million acres. At issue today, as before, is how much of the remaining 2,462,621 acres of endowment lands to retain, how to manage these lands, and how to make such decisions.

The purpose of the endowment lands is defined in the Idaho Constitution. They are to provide the "maximum long term financial return" to the beneficiaries. With 85% of the land acreage, by far the largest beneficiary is the public school system, although there are eight others (Figure 2-1). The answer to the retention of lands question is not simply one of "financial return," but perpetuating the productive capability of the land asset base in order to meet the "long term" part of the mandate.

Central to these issues is the Idaho Department of Lands (IDL), the managers of the trust lands. As stewards overseeing trust land management, state agencies that manage trust lands have learned to "walk the tightrope," providing revenue and benefits for today, and for generations to come, in perpetuity (WSLCA 2001a).

2.5. Citizens' Committee Report and Recommendations to Land Board

In February 2001, Governor Kempthorne assembled a Citizens' Committee to consider management of Endowment Fund assets, including land. In its charter the committee set the goal of making specific recommendations to the Land Board by July 2001. The goal was met. The charter included a statement of purpose and guiding values:

> Purpose:
>
> Recommend efficiency/effectiveness changes to the Land Board regarding Department of Lands, Endowment Funds Investment, Land Board and their interrelationships and management practices.
>
> Overarching Value(s):
>
> - Changes that will help maximize long-term return to the Endowment Funds, balanced with ...
> - Appropriate considerations of other statutory and regulatory requirements, as well as varied public interests (Citizens' Committee 2001)

In its July 2001 Report and Recommendations to the Land Board, the Citizens' Committee (2001) noted that:

> As a result of recent constitutional amendments, changes must now occur to move the handling of these endowment assets to a more integrated investment perspective. This goal requires the consideration and adoption of an Endowment Lands Investment Policy. ... This policy must recognize and take into consideration the ***expected long-term value*** of investment in land assets (Citizens' Committee 2001, emphasis added).

This statement raises some important issues for the Land Board to consider. We provide a method for determining the expected long-term value of forest land and rangeland assets, financial performance measures, and analysis of how different investment policy decisions, such as the choice of a guiding interest rate, may impact asset value and financial performance measures.

2.6. Asset Management Plan

The Citizens' Committee (2001) report recommended that the Land Board adopt an Annual Investment Plan as part of its Land Trust Investment Policy. Part of that plan would presumably include what the Western State Land Commissioners Association refers to as an "asset management plan" (WSLCA 2001b). The WSLCA recognizes the importance of developing an asset management plan for state trust lands in the form of a written document that presents in a clear, easily understood manner, the overall long-term vision, operating philosophy and general direction to be used in managing real estate assets (WSLCA 2001b). Essential for such a plan are three building blocks (see following subsections):

1. General and resource-specific policies and management prescriptions,
2. A land classification system, and
3. Economic and financial analysis and recommendation (WSLCA 2001b).

General and Resource-Specific Policies. The financial analysis component of an asset management plan depends on some guidance in the form of general and resource-specific policies, and a land classification system. To underpin general policies, basic assumptions concerning the environments in which the Idaho Department of Lands operates need to be developed. It is important that these assumptions be reviewed and approved by the Land Board. And it is a good idea to discuss them with stakeholders to ensure "buy-off" of these policy-supporting premises (WSLCA 2001b).

Typically the underlying assumptions are of two types: internal and external. Internal assumptions relate to the historical and projected future operating environment of the Idaho Department of Lands. These assumptions are developed by answering questions such as:

The financial analysis component of an asset management plan depends on some guidance in the form of general and resource-specific policies, and a land classification system.

- What is the extent and nature of the resource base managed by the agency? Is this likely to change in the future?
- Is the goal of the governing board or commission to increase the overall value of the agency's holdings?
- What has been the past position of the agency's governing board toward land trades, sales, and acquisitions? Is this stance likely to continue?
- What are the basic legal and other directives governing the agency's actions? Are changes foreseen which could alter this "operating environment"?
- Should the agency promote development of its holdings? Further, should it participate financially in supporting such ventures?
- Are there minimum target rates of return that the agency should expect from developments on its holdings? (WSLCA 2001b)

External assumptions concern factors not under the control of the Idaho Department of Lands or the Land Board, but which have and will likely continue to impact the agency. Among the questions which lead to generating these assumptions are:

- What has been, and will likely be, population growth? Will this growth occur primarily in areas where the agency manages assets?
- What have the prices been for products produced from land managed by the agency?
- What is the likely future trend in these prices?
- Are new land use regulatory laws likely to impact the use of assets managed by the agency? What might these changes do to impact agency land management activities? (WSLCA 2001b).

Land Asset Classification. Taking a physical inventory of land assets and monitoring their condition over time are important ingredients to the development and implementation of a long-term asset management plan (AIS 2000). As one would expect, state agencies have reported that high value assets were more likely to be intensively monitored and thoroughly inventoried than lower valued assets (AIS 2000). Asset classification will also prove useful and economical when applying environmental and social performance measures (AIS 2000).

In March 2001 the Idaho State Board of Land Commissioners adopted a "Land Classification Policy" (**Appendix D**). This is a key step in developing a land classification system that will facilitate performance evaluation.

Economic and Financial Analysis. This report deals primarily with the third component of an asset management plan, financial and economic analysis. The distinction between them is worth noting. Financial analysis deals only with values that can be measured in monetary terms, either in a market or an estimate of fair market value. An economic analysis builds on financial analysis by considering non-market values (Gregory 1987). In financial analysis, historical revenue streams from major types of resources, or specific types of asset class properties, are compared to the costs of administering and investing in the subject holdings. By conducting such an analysis, the market rate of return for various assets managed by the agency can be determined. This information then can be examined in light of management assumptions and policies (WSLCA 2001b).

Although the primary focus of this report is financial analysis, some discussion of economic factors is provided, including general environmental and social considerations that affect forest lands and rangelands (see **Part 3.6**). The reasons why financial and economic analysis are important are explained in the next section.

2.7. Meeting the Trust Mandate

Despite differences in the authorizing legislation and differing laws in Idaho and other states, the overall management mandate for state trust lands is seemingly straightforward:

- Provide income to the beneficiaries,
- Maximize revenue over time from the entire portfolio, including revenue accounts where applicable, and
- Protect and enhance the trust assets for future beneficiaries (AIS 2000).

There are trade-offs between the maximization of these three goals that can lead to challenges to managerial judgment (AIS 2000). Questions are raised immediately when considering the maximization of short-term income versus long-term protection of the assets (i.e., the trust corpus). How to balance the needs of current generations of beneficiaries compared to future ones, and whether there is a unique role for the trust lands to play in the state's ecological, economic, social and political environment are the types of questions being raised in many states (AIS 2000).

An expanding population, citizen activism, rapid information flows and a broader, more diversified industrial base, have worked together to increase public scrutiny and interest over the use of public and private land (AIS 2000). This has placed new pressures on state trust land managers, who are not only obligated to provide income to the beneficiary in the short term, but must maintain income and the resource base for the long term. Environmental legislation and citizen activism create pressures to manage resources in a broader context, taking into account not only financial considerations, but environmental and social considerations. Performance measures can be established that will aid the resource manager in focusing on the important issues. A management system that balances financial, environmental, and social issues is particularly important for long-term resource sustainability (AIS 2000).

This report reviews the application of financial management principles and tools to forest and rangeland assets. The information in the report is prepared with the same goal in mind as that of the Citizens' Committee (2001)—consideration of the expected long-term value of investment in land assets. This report provides a basis for financial analysis of land assets. Environmental and social performance measures (see **Part 3.6**) also relate to what the Citizens' Committee (2001) report called the "varied public interests" in the endowment lands that drive land management decisions.

The identification and potential disposition of land assets that are underperforming was the key consideration in discussions with the PAG's Advisory Committee on the plan for this study. The implication is that underperforming assets could be improved or replaced with others that would perform better for the beneficiaries.

Demonstrating that the state has met a standard of care involves making a direct, logical and rational connection between management objectives and trust obligations (AIS 2000). Prudent management requires that management objectives—and information about their attainment—be used to measure agency performance. The most common historical measure, and one of the easiest to measure, is the annual income generated for the beneficiary, which is subsequently distributed to the trust beneficiaries or placed in the state's permanent fund (AIS 2000).

A more difficult factor to measure is how the state is protecting (or under- or over-protecting) the productive capability of the trust assets for the beneficiary (AIS 2000). This issue is often framed in the context of whether the trust is protecting the asset corpus or providing benefits to parties other than the beneficiaries. In other words, a common issue is whether assets are being leased (or sold) at the appropriate market value. At times, the decision on this subject becomes the subject of litigation, beneficiary complaints, legislative inquiries and other scrutiny from citizen stakeholders (AIS 2000).

2.8. Measuring Performance

The Western States Land Commissioners Association (WSLCA) recently published a report summarizing current theory and use of performance measures (AIS 2000). Titled *Trust Performance Measurement*, the report was prepared for the WSLCA by Agland Investment Services (AIS), Larkspur, California. AIS was also charged with recommending useful performance measures for the managers of public lands. The AIS (2000) report focused on environmental and social as well as financial performance measures.

The diverse pressures on the managers of public lands, whether forest or rangeland, can be expected to continually increase as the population expands

and resources are put under more pressure (AIS 2000). It is in this context that state trust lands, once considered a quiet backwater in public lands issues, have, from time to time, suffered contentious litigation over their management. Since the lands are held in trust and a beneficiary exists, the management of the lands and the revenue produced take on specific responsibilities most often associated with the fiduciary responsibilities of private trusts. It is in this context that WSLCA's management initiated a study to provide an overview of performance measures, in the broadest context, and how to relate the measures to the management of state trust lands (AIS 2000).

Performance measures can be very broad in scope or quite specific. Indicators can be used to indicate achievement of specific institutional goals, or lack of progress toward goal attainment (AIS 2000). Performance measures can help answer questions related to the management of trust assets. Performance measures most often follow the establishment of an agency's mission and strategic plan. Achievement of goals established within the strategic plan can then be measured over a number of years using specific performance measures (AIS 2000).

Performance measures are most often applied to current activities; however, a significant portion of the financial returns for land is found in asset appreciation or asset enhancement (AIS 2000). Because this will affect the determination of return on asset value, a "total return" evaluation of return on assets includes not only income, but also the change in the value of the assets.

The manager also must not lose sight of the importance of considering long term market changes in land and resource uses. The overall trust goal of "Preservation of the Corpus" may very well depend on new uses of land which in turn generate new sources of income. The AIS (2000) report included discussion of the following emerging sources of income from state trust lands:

- Watershed and water storage,
- Conversion of land to irrigated land,
- Conversion of land to timberland,
- Recreation and eco-tourism,
- Sale of easements, and
- Urban and rural commercial and residential development (AIS 2000).

Performance measures for state trust lands can generally be divided into measuring the performance of [1] the managers of the trust lands and [2] the "health" or condition of the resource portfolio (AIS 2000). The first performance concern focuses on management performance, the second on performance of the asset portfolio. Traditionally, the beneficiary of the trust lands measures the management of trust lands by the performance of the land portfolio in terms of cash return. However, cash flow is not a complete measure of performance. The application of appropriate financial, environmental and social performance measures was presented in the AIS (2000) report. Their findings are summarized in **Part 3.1** of this report.

2.9. Summary and Conclusions

At statehood, Idaho was, like other states, granted lands from the federal public domain to support public schools. Idaho's 2,462,261 acres of endowment lands are managed as a trust to provide "maximum long term financial return" to the beneficiary institutions. These lands include 758,112 acres of primary forest lands, from which timber sales provide 93% of the net income from land assets for the Endowment Fund. The Idaho Department of Lands manages the forest land assets, and also administers grazing leases on more than 1.8 million acres.

Constitutional amendments in 1998 and 2000 gave Endowment Fund managers flexibility to make investments that may be expected to produce higher returns for the beneficiaries than government bonds, which was a limitation before 2000. The implications of the Endowment Fund reform amendments on the management of endowment lands include a refocusing on the financial performance of land assets. The requirement to protect and enhance trust assets for future beneficiaries involves environmental and social considerations as well as revenue production.

A Citizen's Committee assembled by the Governor, who chairs the State Board of Land Commissioners, recommended that the Idaho Department of Lands develop an investment plan, perhaps similar to what the Western States Land Commissioners Association calls an asset management plan. Components of such a plan might be a statement of policies, a land asset classification system, and a financial and economic analysis.

Performance measures in the financial, environmental, and social dimensions can be used to help answer questions about trust land management, including management trade-offs and improvements.

Part 3. Identifying "Underperforming" Land Assets

Performance evaluation is a component of an asset management plan (**Part 2.6**). The process for identifying lands that are not adequately performing—what the Idaho Department of Lands (2000b) calls "underperforming"—involves selecting a standard or target, then evaluating the land portfolio to determine which lands are not meeting the target. Evaluation includes accounting for current revenues and costs, and appraisal of land asset value. Financial targets can be based on measures of the net income from land expressed as a percentage of land asset value, or return on asset value (ROA). After analyzing the expected financial returns from parcels of land, those that do not promise to earn the target rate of return are considered to be underperforming financially. A key decision is what to do with underperforming land assets. This is addressed in **Part 7** by considering several alternatives.

This report reviews the procedures for evaluating the performance of land assets. A key consideration for determining return on asset value is appraisal of asset value. Although there is a technical distinction between an asset's appraised fair market value and its value to an individual investor, this report treats such evaluations approximately the same because the asset evaluation is being done by the current owner. In general, though, *the procedure for finding an investor's value of an item is called* ***valuation*** (Klemperer 1996, emphasis in original). Examples are discounted cash flow analyses presented in **Part 3.2**. The monetary value of land to an individual investor—for example, a buyer's willingness to pay or an owner's willingness to sell— may be more than, less than, or equal to market value. ***Fair market value*** of an item is an opinion of its most likely selling price between a willing buyer and seller, for which one might expect similar items, similarly situated, would sell for. *The procedure for finding fair market value is called* ***appraisal*** (Klemperer 1996, emphasis in original; Colburn, review comments).

3.1. Performance Measures for State Trust Lands

There are two performance measures that come into play in evaluating performance: [1] management (manager) performance, and [2] resource (fund) performance (AIS 2000).

Management (Manager) Performance. What portion of total return is attributable to the value added to portfolio assets by making good, timely decisions, and acting on them effectively? (AIS 2000). Evaluating managerial performance is complicated because good decisions sometimes have bad outcomes, and bad decisions sometimes have good outcomes (Wiggins, review comments). Furthermore, environmental and social considerations are part of the context within which financial decisions are made.

A manager cannot be evaluated regarding decisions the manager is not authorized to make or act upon (AIS 2000). For example, the constitutional limitation on land sales of 100 sections per year places liquidation of Idaho endowment land assets outside the manager's authority.

In addition, certain results occur out of random events that equally affect all managers and cannot be controlled by the manager (AIS 2000). Although management performance is an important concept, the evaluation can quickly become complex. The trust land manager deals with two important forces. In the management of state trust lands, maximization of revenue is of prime importance, but it is accomplished within the context of protection and sustainability of the asset portfolio. In contrast, for a variety of reasons political leaders and the general public are often particularly interested in the social and environmental aspects of the resource and land portfolio (AIS 2000).

Resource (Fund) Performance. Fund performance is a straightforward calculation of total return to and risk associated with an entire portfolio (AIS 2000). The manager of trust lands often is in the difficult position of making decisions either to provide short-term revenue to the beneficiary or taking actions that can lead to higher levels of revenue in the long term and/or provide indirect benefits to the general public. There are usually a number of trade-offs in the management of natural resources. There are those who believe that the trust manager, as manager of public resources, has a higher standard of stewardship (AIS 2000). The management of lands and resources under a trust concept argues for sustainability (Souder and Fairfax 1996). The legal and performance measures relating to the sustainability issue are covered fully in the AIS (2000) report and summarized herein in the context of timber management (**Part 4.7.3**). PAG Report #19 (Cook and O'Laughlin 2000) thoroughly addressed sustainable timber harvesting on all forest ownerships in Idaho.

Financial, Environmental and Social Performance Measures. When viewed over time, performance measures assist trust managers and beneficiaries in understanding and quantifying trends. In turn, an understanding of the relationship between financial, environmental, and social factors can assist in explaining policy and programs to local and statewide political leaders, as well as to the general public (AIS 2000). A variety of performance measures are most often selected by the management team, in consultation with public officials and the trust beneficiaries (AIS 2000). At the start, a limited number of broad measures can be established that reflect key factors and issues. As confidence develops and management systems are put in place, more precise measures can be used. Based on suggestions in the AIS (2000) report, a variety of performance measures in the financial, environmental, and social categories can be identified.

Financial measures have been the cornerstone of investment management decision making, and are likely to continue in importance (AIS 2000). Environmental measures have become increasingly important. Although a state trust land resource manager may have little direct impact on the surrounding population, social measures can nevertheless be important because unhappy or disgruntled voters in specific counties can influence their legislators and other elected officials to change management systems or policies or restrict specific plans put in place by the land manager (AIS 2000).

The following lists provide examples of basic approaches to measure gain or loss, usually measured on the total portfolio, groupings of similar assets, or on a regional basis (AIS 2000):

Financial
- Net income generated for schools and other beneficiaries
- % Increases (decreases) of net income from prior year(s)
- % Resource management expense of total revenue
- % Total return on assets (net income plus change in asset value)

Environmental
- Soil erosion/compaction
- Water quality
- Specific levels of pollutants
- Habitat quantity or quality
- Land productivity; i.e., yield per acre

Social
- Income generated for schools and other beneficiaries
- Recreation days per year
- Economic diversity index (related to changes in industry structure)
- Community outreach; e.g., number of persons attending meetings/year or use of surveys to determine community interest and understanding (AIS 2000).

The needs of the trust beneficiaries must be met by the management decision process and performance measures (AIS 2000). Environmental and social performance measures indicate long-term and cumulative impacts on the land and have either a positive, negative, or neutral impact on future cash flow and asset value. The above list of factors and the direction of impacts on values and cash flows is revisited in **Part 3.6.3.**

3.2. Financial Analysis: Discounted Cash Flow Techniques

Discounted cash flow is a procedure well suited to the analysis of almost all financial investments, including forestry (Gregory 1987) and rangeland management (Workman 1986). A discounted cash flow analysis consists of several steps:

1. All expected inputs and outputs are specified quantitatively.
2. Each input and output is scheduled; i.e., the timing for each input or output is specified.
3. A value is placed on each input and output.
4. Future values of inputs and outputs are discounted to the present time, using a specified interest rate.
5. Discounted values are combined into some measure of profitability (Gregory 1987).

The concept of a "project" is important in financial analysis (Gregory 1987). A project is any planned investment undertaking or proposal that can reasonably be analyzed or evaluated as an independent unit. For example, a large-scale industrial forestry project would be planting a 300,000 acre pulpwood forest over a 20-year period, plus building the pulp and paper plant needed to convert the wood, constructing the road system and acquiring the equipment for harvesting the wood, and so on. A small-scale project might consist of thinning trees on one

acre in a farm woodlot. Projects are not defined by size or cost, but rather a positive answer to the question, does it make sense to evaluate this activity as an independent undertaking? The project approach provides a general framework for making decisions that have economic content or implications, and this covers most forestry decisions (Gregory 1987). Rangeland management projects are approached similarly (Workman 1986).

In a financial sense, if you consider trees and land as capital, two of the most important inputs into forestry are capital and time (Klemperer 1996). Similarly, most rangeland management projects require capital expenditures, with benefits over a number of years (Workman 1986). How can capital and time be allocated in a way that maximizes satisfaction?

Investors can use standard financial analysis tools to evaluate land and resource management decisions, including how much to pay for properties, which management practices to undertake, and how profitable investments are (Klemperer 1996).

Even for public projects, where decisions may be based on social or political factors, a financial analysis of some type is useful. If programs and projects are to be implemented, they must be financed and the funds obtained from some source. Discounted cash flow analysis lets the agency's financial officer know how much must be on hand to meet project expenditures and when the money must be there (Gregory 1987).

To take time directly into account calls for a good working knowledge of compound interest and the techniques of discounting, as well as a basic understanding of the principles governing physical changes on the land resource base such as timber growth (Gregory 1987). It costs money to use land and capital resources over time, and the rent or price paid per unit of time is measured by the interest rate. Interest costs dominate much forestry decision analysis, and familiarity with financial analysis techniques, including the arithmetic of compound interest, is an important part of a forester's special skills (Davis and Johnson 1987).

3.2.1. Income Capitalization Formula

The financial analysis criteria used in forest land and rangeland evaluations are variants on the income capitalization formula for determining the present value of land based on its expected annual returns. According to resource economists, the value of agricultural land is equal to the cash amount that, when placed in an interest-bearing account, would return every year the same net income as the land (Gregory 1987). The general assumption is that the land will return the same net income every year in perpetuity. The land value is the capitalized value of the expected annual net income (Gregory 1987), according to the formula:

$$V_0 = A / i$$

where:

V_0 = value at time zero (i.e., the present value)
A = annual net income (benefits in the form of cash returns, minus cash costs)
i = capitalization rate, or discount rate, expressed in decimal form (i.e., 6% = .06).

For example, the value of an acre of farmland that nets $50 each year is $625 at 8%. At 6% the same land is valued at $833; at 10% it is $500. The selection of the appropriate capitalization rate obviously is a crucial factor in determining the value of the land. Similarly, the choice of the rate at which to discount future cash flows is crucial in investment analysis. Further discussion of an appropriate rate is provided in **Part 3.3**, as well as discussions specific to forest land (**Part 4.3**) and rangeland (**Part 5.2**) later in the report.

3.2.2. Capital Budgeting and Valuation Formulas: NPV, LEV, and IRR

Capital budgeting techniques based on discounting future cash flows have been the principal methods for analyzing investments in forest land and rangeland. The forestry literature has many examples of how these techniques can be used to determine not only the value of investments in management of the timber asset, but also investments in timberland (Zinkhan and Cubbage 2001). Range management literature illustrates how these same techniques can be used to evaluate proposed rangeland improvements, and to explain how rangeland values are determined (Workman 1986). The application of these techniques to Idaho state trust lands is provided in **Part 4** for forest lands and **Part 5** for rangelands.

Formulas. The most often used capital budgeting criteria in forestry are the net present value (NPV), land expectation value (LEV), and internal rate of return (IRR). Each technique has advantages and

disadvantages (Zinkhan and Cubbage 2001). The LEV is a variation on NPV, and is useful for appraising asset value based on estimates of future financial costs and returns. The two formulas are:

$$NPV = \sum_{t=0}^{T} B_t (1 + i)^{-t} - \sum_{t=0}^{T} C_t (1 + i)^{-t}$$

$$LEV = \frac{\sum_{t=0}^{T} B_t (1 + i)^{-t} - \sum_{t=0}^{T} C_t (1 + i)^{-t}}{1 - (1+ i)^{-T}}$$

The IRR is most useful in evaluating individual project investments, rather than overall asset portfolio performance. The IRR is defined as the discount rate that equates the present value of the benefits with the present value of the costs:

IRR = i at which:

$$\sum_{t=0}^{T} B_t (1 + IRR)^{-t} = \sum_{t=0}^{T} C_t (1 + IRR)^{-t}$$

where:

B_t = a benefit at time t
IRR = i = discount rate, in decimal form
C_t = a cost at time t
T = lifetime of project

Although it is not used in the evaluation of total return on assets presented in this report, an investment project's internal rate of return (IRR) is the rate that will make the sum of all discounted project costs exactly equal to the sum of all discounted project revenues, which means it is the discount rate that makes the net present value of a project equal zero (Gregory 1987). This measure has several names: the profitability index, the project rate of return, the ROI or return on investment, but is probably best known as the IRR.

Similarities and Differences. As the formulas indicate, these three criteria are closely related. The unifying concept is the discounting of future benefits and costs to the present time with an interest rate, or discount rate. The choice of that discount rate is an important policy decision, considered herein as the choice of a "target" rate of interest (see **Part 3.3**). The IRR is not used in land valuation applications, where LEV (a variation of the NPV) is the appropriate technique. The LEV can also be used as a project-level decision criterion.

Project-level Analysis. The NPV converts a series of periodic income flows to a single number that can be used to compare mutually exclusive investment alternatives over the same investment horizon at a given discount rate or cost of capital. For project investment decisions, one would accept an investment that has a positive NPV if enough capital were available. If the NPV were negative, one would reject that investment. In order to compare NPVs of different investment lengths (rotation ages in forestry), one would have to convert all those investments to the same horizon, such as the least common denominator of all time horizons (Zinkhan and Cubbage 2001). The LEV uses infinity as the common time horizon.

The LEV calculates the sum of present values of an infinite or perpetual series of identical cash flow cycles at a given discount rate. The perpetual cycles can be periodic or annual (Straka and Bullard 1996). When used as a project-level decision criterion, the LEV is a simple way to compare investments with different time horizons by using infinity as the common time horizon denominator. LEV is applied just like NPV in making investment decisions, with positive LEVs inferring investment acceptability, and negative LEVs suggesting project rejection (Zinkhan and Cubbage 2001).

Land expectation values were developed by German forester Martin Faustmann (1849) for valuing forest land for tax purposes, and are sometimes called soil expectation values (Gregory 1987). Faustmann's formula is now generally called the LEV. It has been a cornerstone of forest management because it can be used to determine the optimal regime for timber growing that maximizes the value of bare land based on its biological productivity and expected response to management.

Land Valuation. The income capitalization formula ($V_0 = A / i$) used to value agricultural and grazing lands that produce annual incomes is similar in concept and application to the LEV, in that the future perpetual net income stream is discounted to a present value with a discount rate. The LEV formula is a perpetual *periodic* series, whereas the income capitalization formula is a perpetual *annual* series. Both formulas assume the same income stream indefinitely, and both discount the future income

stream to the present time. The major difference is that a forest stand cannot be expected to produce the same amount of income each year, unless the owner has a very large forest holding and manages the yield of timber products to sustain approximately the same cut each year. The Idaho Department of Lands attempts through management to do that (Wiggins, review comments).

LEV is most often used to value even-aged plantations, where LEV calculates the value of bare land in perpetual timber production (Straka and Bullard 1996). LEV is also useful in valuation of timber stands cut periodically. It can be used when a tract of land is harvested annually. In this case, the value of land and timber are established concurrently, and one cannot be separated from the other. In effect, this discounted cash flow technique is used to value a perpetual timber production "factory" (Straka and Bullard 1996). In the forest valuation process, land and timber values are estimated jointly rather than separately (Bullard and Straka 1998).

Land expectation value (LEV) is a discounted cash flow technique that can be used for valuing large timber properties or grazing lands providing the same product value each year.

When a forest holding is large enough that the same amount of timber can be harvested each year, then T = 1 and the LEV formula reduces to LEV = A / *i*, which is identical to the income capitalization formula V_0 = A / *i* commonly used to value agricultural and grazing lands that produce the same annual net income, year after year. Land expectation value (LEV) is a discounted cash flow technique that can be used for valuing large timber properties or grazing lands providing the same product value each year. The LEV is used to appraise the value of Idaho endowment forest land in **Part 4.5.4** and rangeland in **Part 5.3.3.**

3.3. Selecting an Appropriate Interest Rate

This part of the report provides background discussion for selecting an appropriate interest rate to use in financial performance evaluation. The choice is an important policy decision, and we do not offer a specific recommendation. **Part 3.3.1** briefly describes what a target rate of return is. **Part 3.3.2** discusses the difference between a target rate and the discount rate. **Part 3.3.3** presents ideas from the Citizens' Committee (2001) report on a suggested target rate for Idaho endowment lands and other related financial goals and parameters. **Part 3.3.4** discusses the relationship of interest rates, inflation, and risk. Discussion of the appropriate target rate is provided in **Part 3.3.5**, with further consideration of a target rate specific to Idaho endowment forest lands in **Part 4.3** and rangelands in **Part 5.2.**

3.3.1. Target Rate of Return

Whether an asset is performing adequately in the financial sense requires identification of a target rate of return. This is a threshold value for a rate of return criterion, or what Klemperer (1996) calls the minimum acceptable rate of return. This rate of interest would be used to determine which lands are performing above that level, and those which are not. This criterion is sometimes called a hurdle rate or target rate (Citizen's Committee 2001). It is also sometimes called a guiding rate of return or an alternative rate of return, because the chosen rate guides the investor's decisions, and reflects what an alternative investment represents as the opportunity cost of capital (Gregory 1987). It is also a discount rate used to adjust for timing differences in cash flows over the investment time horizon, again reflecting the opportunity cost of capital (Zinkhan and Cubbage 2001). The discount rate also includes expectations of future revenues, expressed as financial risk (Klemperer 1996).

The target rate is a policy decision of considerable importance. Because of the trade-off between rate of return and financial risk, this policy decision is not easy for investment instruments such as stocks and bonds. The target rate policy decision is even more problematic for real estate, especially lands used for timber production or grazing. The target rate is used to discount future cash flows to a present value, in recognition that a dollar received in the future is worth less than a dollar in hand today. As well as an expression of the opportunity cost of invested capital, the target rate is an expression of how much the investor values the future in relation to the present. The higher the target rate, the less the investor values the future. In addition, the longer the payoff period involved in an investment, the lower the associated premium for financial risk will be (Klemperer 1996).

When land assets are viewed as capital investments, the target rate also performs another role by guiding the decisions of managers. Again, the higher

the target rate, the less the future is valued in comparison to the present. The choice of a target rate has a profound influence on resource management. For example, the higher the target rate, the less time trees are allowed to grow (see **Part 4.3.2**).

To summarize the importance of the target rate of return, the choice of the target rate affects:

1. how the performance of land asset managers is judged,
2. how managers view the future in relation to the present,
3. when resource management activities will take place, and
4. what capital intensity, or level of investment in management activities, will be employed.

The internal rate of return (IRR) indicates the annual rate of return that an investment would generate. For individual project-level investments, the IRR is usually compared with some given hurdle or target rate, or with rates other potential investments might earn. Projects with IRRs greater than the target rate or other potential alternative rates of return are considered acceptable, given adequate capital (Zinkhan and Cubbage 2001).

Choice of the target rate also is a choice of the discount rate (Citizens' Committee 2001). The discount rate is crucial for discounted cash flow analyses and decisions (Zinkhan and Cubbage 2001). High discount rates will tend to favor short-term investments with short paybacks, because the future value of something with a large discount rate will be very small. The discount rate represents an organization's opportunity cost of capital for an investment. For private firms this is often calculated as the weighted average of debt (loans) and equity (stock). For public organizations, the cost of capital is usually determined by the government or by an international lending agency. It too represents some average of debt financing such as the cost of government borrowing. For all investors, the discount rate is the alternative rate of return that the investor could receive in some other investment (Zinkhan and Cubbage 2001).

The Idaho Department of Lands does not borrow capital, so it does not have an identifiable cost of capital. However, the concept of opportunity cost is relevant. Does it make sense for the Department to make investments of public funds in land and resource management that promise to earn less than alternative investments? An efficiency argument would say no; a social benefit argument might say yes. A financial analyst would say no; an economist might say yes. For the endowment lands, an alternative rate of return is the appropriate concept.

3.3.2. Is the Target Rate of Return the Same Thing as the Discount Rate?

The target rate and discount rate are distinctly different but closely related concepts. The discount rate is used to determine the present value of anticipated future costs and returns through discounted cash flow techniques. The results of discounted cash flow analysis are used to guide management decisions, including when to cut trees, and for estimating the value of land assets. The target rate is a performance benchmark used to make judgments whether assets are earning an adequate rate of return.

What interest rate is appropriate? Simplicity argues that the rate for discounting cash flows and target performance be one and the same. While procedures and systems for evaluating financial performance are developed, a range of interest rates from 3% to 7% makes sense.

Both the discount rate and the target rate are set as policy decisions. It is conceivable that an organization may use a discount rate that is different than its target rate. However, if the purpose of the discount rate is to ensure that investments are efficient uses of capital and the discount rate represents either the cost of capital to the organization or the best alternative use of funds, then it is also the target rate, because an efficient organization would neither borrow money and invest it in a project that would not at least promise to earn enough to repay the cost of borrowed capital, nor invest in a project when alternative projects offer higher returns.

What interest rate is appropriate? Simplicity argues that the discount rate and target rate be one and the same. This is consistent with the Citizens' Committee (2001) report, which said, in reference to appraising land value with the income method, that the discount rate should be consistent with the minimum target rate established as a performance objective for the land. While procedures and systems for evaluating financial performance are developed, a range of interest rates from 3% to 7% makes sense. Justifications for this range are presented in the next three sections.

3.3.3. Citizens' Committee Target Rate Recommendation

The discount rate appropriate to any investor is the investor's opportunity cost of the needed capital, and this is seldom either an easy or precise calculation (Gregory 1987). Yet there is none more important. For example, the target rate will influence the optimal rotation or cutting age on forest lands, and will affect the land expectation value (LEV). The higher the target rate, the lower the timber cutting age and land value (Klemperer 1996). The interest rate used for discounting is one of the principal determinants of the economic feasibility of improvements to rangelands (Workman 1986).

The Idaho Citizens' Committee (2001) report provided some guidance on appropriate financial measures, including using 6% as the target rate of return (**Appendix E**). Is 6% an appropriate target rate? The rationale given by the Citizens' Committee is that 6% is the real rate of return objective for most pension fund real estate programs. Using the same rationale, one could argue that if pension funds are taxed at 40%, then a comparable rate for state endowment trusts would be 8.4% (Weston and Brigham 1981). This would adjust for the tax exempt nature of public agencies (McKetta, review comments; Row et al. 1981). Other analysts, however, argue that discount rates in the public sector should be "considerably lower" than those for private investment (Gregory 1987).

There is valid rationale for either argument. Analysis in **Part 4.3.2** shows that the Department of Lands is currently using an implicit target rate of less than 2% to guide what is perhaps its key forest land management decision—when to harvest trees. The agency allows trees to grow at least 80 years before harvest (Bruna and Bacon, personal communication). A target rate higher than 2% probably is warranted, but is 6% high enough or is it too high? Again, a rationale can be developed to support arguments that the target rate could be 6%, or higher, or lower.

The effect of high discount rates on resource utilization has also led some economists to suggest that natural resource projects should be discounted at lower rates than other types of projects (Gregory 1987). However, some allege that inefficient capital allocation is more likely in government because agencies may not always ferret out the best investments as effectively as businesspeople (Klemperer 1996). To address this problem, the U.S. Office of Management and Budget suggests a 10 percent minimum acceptable rate of return for federal agencies. However, because of differing risk, not all projects should earn the same expected rate of return, and not all agencies use the same minimum rate of return, although not necessarily for reasons of differing risk (Klemperer 1996). The real earnings rate for private firms on triple-A corporate bonds *after taxes* was around 2.3% during the 1960-1978 period. Adjusted for an average corporate tax rate of 40%, the earnings rate on productive assets *before taxes* would be 3.6% to 3.9%. On this basis, the U.S. Forest Service has recommended using a "slightly conservative" 4% discount rate for long-term land and resource planning (Gregory 1987, Row et al. 1981).

3.3.4. Interest Rates, Inflation, and Risk

The interest rate is a composite of three elements: [1] a "pure" risk-free rate, approximated in the marketplace by U.S. Government Treasury notes when there is a full employment economy and no inflation; [2] a risk factor added to the interest rate charge to reflect the different amounts of financial risk associated with different investment opportunities; and [3] the expected rate of inflation (Workman 1986, Davis and Johnson 1987).

Inflation. Inflation is generally treated in forestry investment analysis by dealing only with "real" or constant rates, i.e., inflation is excluded. A "nominal" or current rate includes inflation. In timberland investment analysis, inflation should either be included in the timberland rate of return, or adjusted out of whatever alternative timberland is being compared to, such as stocks or commercial real estate.

Unless otherwise stated, all interest rates and price changes will be considered in real terms, excluding inflation. Inflation, or the general rise in prices, is assumed to be zero (Klemperer 1996). Most forestry projects and investments are calculated initially with a before-tax, real (i.e., without inflation) discount rate. Effects of inflation or taxes can be important, and can be added to the analysis as necessary (Zinkhan and Cubbage 2001). The same caveat holds for analysis of grazing and other uses of endowment lands. The remainder of this section and the next draw from the forestry literature, but the concepts also apply to long-term considerations in rangeland management.

Risk. One of the most important questions in investment analysis is how to deal with risk and uncertainty (Klemperer 1996). In economics, as in

decision theory, risk is usually applied to events that have a known probability or probability distribution of outcome, whereas the term uncertainty is reserved for events whose outcome has no known probability distribution. The treatment of risk and uncertainty in project analysis is a major subject for debate among economists (Gregory 1987). Risk, in the financial sense, is simply the variance of expected values.

Risk is a frustrating topic, because the guidelines are so fuzzy (Klemperer 1996). The essential problem with risk and uncertainty is that we don't know some things for sure. We yearn for precise decision guides, equations, and computer programs to tell us to the nearest penny the value of investment alternatives. Unfortunately that desire is not realistic given the nature of the world, especially with long payoff periods such as in forestry (Klemperer 1996).

In practice, most forestry project analyses do not distinguish between risk and uncertainty (Gregory 1987). There is considerable justification for treating risk and uncertainty the same. The long time periods involved in timber production and the lack of precise information on timber yields or probable outputs of recreation, wildlife, and other products have discouraged most analysts from attempting to calculate future production probabilities. The result is that with forestry projects much of the important data—future prices, future costs, future yields, future interest rates, and even future harvesting and marketing techniques, are uncertain (Gregory 1987). Nevertheless, some analysts are willing to estimate the risk associated with long-term investments (McKetta, review comments).

Investors should be aware of the pitfalls in applying typical short-term discount rates to forestry ventures. This point is crucial. There are problems using short-term interest rates for long-term investments. One shouldn't necessarily cry "Inefficiency!" if forestry investments are evaluated with, say, a 5 or 6% risk-adjusted discount rate despite higher returns observed elsewhere.
– *Forest Resource Economics and Finance* (Klemperer 1996)

The purpose of considering financial risk is to identify appropriate discount rates for investments. There can be no such thing as a single "correct" risk-adjusted discount rate for expected values from forest lands (Klemperer 1996). In reality, a different discount rate, adjusted for risk, should be used for each separate investment project cash flow. Factors to be considered are the probability distribution of cash flows, how far in the future cash flows occur, and the decision maker's attitudes toward risk. The analyst can hope to give only rough guidelines for different situations, and simple advice for timberland investors does not exist (Klemperer 1996).

The perception of many financial analysts is that timberlands are low risk (Binkley et al. 1996, see **Part 4.7.2**). Based on perceptions of low risks associated with timberland investments, the appropriate, risk-adjusted guiding rates of interest for timberlands may actually be lower than the yields available from financial markets taken as a whole. Virtually no economic aspect of forestry will escape this realization, from optimal economic rotations to questions of appropriate land use (Binkley et al. 1996).

Forest industry analysts sometimes say they use real after-tax discount rates ranging from 4 to 8 percent for long-term forestry investments, but they are understandably reluctant to be quoted (Klemperer 1996). For example, in forests where fire or insects pose high physical risks, analysts would adjust expected cash flows to reflect the expected loss of physical products (Klemperer 1996). Such risk is also reduced when large timberland tracts are being managed (Wiggins, review comments).

There is a defensible rationale for using risk-adjusted forestry discount rates lower than typical industrial rates of return (Gregory 1987). However, the caveat is to discount with realistic expected values of revenues, not overly optimistic projections (Klemperer 1996). What is a typical industrial rate of return? Assuming present value-maximizing behavior, Berck (1979) found that private forest owners in the Douglas-fir region have chosen harvest rates as if they discounted future timber revenues at a 5 percent real before-tax interest rate. Using a 3 percent real risk-free interest rate, this implies a 2 percentage-point risk premium. One interpretation could be that holding Douglas-fir timber requires a risk premium lower than other industrial investments (Klemperer 1996).

Handling risk by adjusting the discount rate is at best problematic, but since the method is so widely used, investors should be aware of the pitfalls in applying typical short-term discount rates to forestry ventures (Klemperer 1996). This point is crucial. There are problems using short-term interest rates

for long-term investments. One shouldn't necessarily cry "Inefficiency!" if forestry investments are evaluated with, say, a 5 or 6 percent risk-adjusted discount rate despite higher returns observed elsewhere (Klemperer 1996). Differences in average rates of return can be acceptable if they represent varying risk levels and payoff periods. The efficiency guide for capital allocation is that rates of return on added investment should be equal for all enterprises on an implicit risk-free basis, rather than risk-adjusted. In his book *Forest Resource Economics and Finance*, Klemperer (1996) advises starting with a fixed risk-free real discount rate of 3 percent and add varying risk premiums for discounting revenues with different risks and payoff periods. Workman (1986) points out that the risk rate should be added to the riskless discount rate in the benefit stream, and subtracted from the riskless rate in the cost stream.

3.3.5. What Target Rate is Appropriate?

If data are available, computer simulations can be used to construct distributions of financial performance measures for individual projects and let decision makers compare them (Klemperer 1996). Applying this idea, we suggest that evaluation of Idaho Department of Lands return on assets be done with different interest rates. The U.S. Forest Service uses 4% for long-term investment analysis. The Idaho Department of Lands currently uses 5% to evaluate silvicultural investments (Bruna, personal communication). The Hancock Timber Resources Group uses 6% to evaluate timberland investment, including the timberlands the organization manages for the California Public Employees Retirement System (CalPERS). Based on what CalPERS (2000) does, 6% is also the recommendation of the Idaho Citizens' Committee (2001) report. The Washington Department of Natural Resources uses 7% (Souder and Fairfax 1996). Analysis of financial performance with different rates in the range of 3% to 7% can be presented to the Land Board until such time as the Department and the Land Board develop an understanding of the pervasive impact the target rate decision has on forest and rangeland management.

3.4. Asset Valuation and Appraisal Methods

Each asset has its own particular valuation attributes (AIS 2000). Some are as simple as the market price being published in the local newspaper. Other assets require professional valuation (Box 3-1).

As a first step in asset valuation, similar assets can be grouped into specific categories and an average value applied to the category (AIS 2000). By grouping assets, changes in value of one or several parcels can uniformly be applied to the asset group. The Land Board's "Land Classification Policy" (**Appendix D**) could facilitate valuation of different asset classes by grouping them logically.

Although some precision is lost in the process of grouping assets, the law of averages will provide sufficient accuracy and grouping will reduce the overall cost of valuation (AIS 2000). A more precise approach than averaging would be regression analysis of transactions, such as timber sales, to identify the source of value differences and to develop coefficients for valuation models (McKetta, review comments).

Another approach to asset valuation is to obtain assistance in establishing values for each class of land from a local professional appraiser (AIS 2000). Still another is to use values developed by local county assessors (AIS 2000). However, this relies on tax appraisal methods designed to provide fair market value. The Idaho tax valuation method is a productivity formula, not an attempt to establish fair market value. Nevertheless, Montana uses a productivity valuation formula to establish land value for financial performance evaluation (see **Part 4.4.3**). Whatever the system is, once it has been established it can be updated each year and used to develop measures of financial return (AIS 2000).

3.4.1. Appraisal Methods

The idea of fair market value, and how to find it, relies on a procedure called *appraisal* (Klemperer 1996). An appraisal is an *opinion* of value, and is heavily contingent upon availability of relevant data and the choice of appraisal technique (Colburn, review comments). According to federal appraisal standards used by the BLM and the Forest Service, fair market value is defined as the amount for which a property would be sold—for cash or its equivalent—by a willing and knowledgeable seller with no obligation to sell, to a willing and knowledgeable buyer with no obligation to buy (US-GAO 2001). The standards require an appraiser to first identify the property's "highest and best use," which is defined as the use that is physically possible, legally permissible, financially feasible, and maximally profitable for the owner (US-GAO 2001).

Box 3-1
Attributes of Asset Classes that Affect Valuation

Stocks and bonds are traded on public markets providing indications of value constantly. These types of assets provide rapid liquidity and market transparency. In some cases, even publicly traded securities lack a trading volume to readily absorb large transactions without affecting the market price. Valuation assumes an orderly transaction that would only occur as quickly as to avoid a market impact.

Timberlands — Timberland has two components of value: 1) the land itself and 2) the trees or standing timber. The land derives its value in being able to support and sustain tree growth. Land that enhances tree productivity is more valuable than land that does not. As the trees grow, the proportion of the timberland value represented by the land itself becomes a smaller portion of the total value.

Standing timber derives its value from the market price in the lumber and pulp markets. These are products that trade daily with prices published by various industry groups for different product types and delivery locations. Standing timber is then valued at market price less the costs of harvest, milling and processing and delivery to the market. Timber appraisers utilize professional forest sampling techniques to estimate the quantity and quality of standing timber in a particular tract. Of course, not all the standing timber is ready for harvest or can be harvested in a single market (a particular point in time) and therefore, long-term market prices should be used for an entire forest property. The quantity of timber will vary over time due to growth and harvest, and even changes in harvest limitations due to environmental factors. [Additional analysis and valuation of forest land as an asset is provided in **Part 4.**]

Range and Cropland values are based on the income produced and the current market value/transactions for similar property. An appraiser gathers information on actual property sales and compares these with the subject property being valued. Adjustments are made to account for differences between the properties such as for timing, productivity, market activity, and others. Then a value is determined based on the income the property can produce multiplied by a factor that converts income to value called the "capitalization rate." This is the inverse of the return a buyer would require to want to purchase the asset. The comparable sale approach can also be used for determining an appropriate capitalization rate. [Additional analysis and valuation of rangeland as an asset is provided in **Part 5.**]

Source: *Trust Performance Measurement* (AIS 2000)

Three appraisal methods, or procedures for finding the market value of assets, are common: *comparable sales*, *income capitalization*, and *replacement cost* (Klemperer 1996):

- The best appraisal method is based on an average of actual sales prices for a given type of asset—the *comparable sales* approach, comparing the property with others that have been sold.
- When sales evidence is insufficient, appraisers often use the *income capitalization* approach, which is an NPV based on inputs most likely to be used by the average buyer (rather than one particular investor, as is the case in valuation), determined by applying a capitalization or discount rate to the property's potential net income. Regression analysis of past stumpage sales can be used to appraise stumpage value.
- Appraisals based on *replacement cost* are useful for buildings and other land improvements, but not generally suitable for forests unless they are planted only a short time ago.

The BLM and Forest Service must use one of these three appraisal methods (US-GAO 2001). Federal appraisal standards generally address appraisal procedures and documentation rather than outcomes. The standards explicitly allow for the application of professional judgment in estimating a property's fair market value: "The appraiser should not hesitate to acknowledge that appraising is not an exact science and that reasonable men may differ somewhat in arriving at an estimate of the fair market value." Before either the BLM or the Forest Service uses an

appraised value, an agency appraiser must review the appraisal report, assure it complies with federal appraisal standards, and approve it for agency use (US-GAO 2001).

The *comparable sales* approach is generally considered to be the most reliable when sufficient market data are available. It considers various factors—such as the location, size and other physical characteristics, and uses of the properties—to estimate the extent of comparability between the property being appraised and the comparable properties. On the basis of the prices of the properties that are judged to be the most comparable, the appraiser then estimates the fair market value of the property being appraised (US-GAO 2001).

As the Citizen's Committee (2001) pointed out, the *replacement cost* method is not appropriate for appraising Idaho's endowment lands, and the limited number of *comparable sales* makes that approach infeasible. There is absolutely no choice but to use a discounted cash flow *income capitalization* method for appraising the value of Idaho endowment forest lands and rangelands.

3.4.2. Total Return on Assets Method

Although there is no choice but to use an *income capitalization* approach to valuation of Idaho endowment forest lands and rangelands, there is considerable discretion in deciding what to include as expected future values in discounted cash flows. A "total return" method is favored by economists, which means the change in land value is part of the return on land assets, along with net income (Binkley et al. 1996, Klemperer 1996). This approach is also recommended for state trust lands in the AIS (2000) report to the Western States Land Commissioners Association. Because a fundamental factor in financial performance is measurement of asset appreciation (AIS 2000), a "total return" approach is preferred to just an income approach.

Because a fundamental factor in financial performance is measurement of asset appreciation, the "total return" approach is preferred to just an income approach.

Although state land mangers can easily measure net income and cash flows, the wide range of asset classes and dispersal of the lands under management makes it difficult (and expensive) to establish asset values, particularly on a year-to-year basis (AIS 2000). But it could nevertheless be done (McKetta, review comments). Because a significant portion of the financial returns for land is found in asset appreciation or asset enhancement, the AIS (2000) report recommended establishing land asset values on an annual basis either through an appraisal process or estimation procedure based on class of asset.

The landowner needs to earn interest on all the capital, which includes resource income plus land value. Initially, the assumption is that the land could be sold at any time for a given market value, which the owner sees as independent of costs and income from ownership (Klemperer 1996). For example, the timberland held by most private sector institutional investors (i.e., pension funds, endowments, and foundations) is "market to market" (Binkley et al. 1996). In other words, the institutions carry their timberland assets at the land's estimated market value—rather than its conventional book value—and measure their periodic returns for time period t by the total return method:

$$\text{Return}_t = [\ \text{Net Income}_t + (\ \text{Market Value}_t - \text{Market Value}_{t-1}\ )]\ /\ \text{Market Value}_{t-1}$$

In this formula Net Income_t is the net revenue produced by the timberland during period t (this formula assumes receipt at the end of the period). Market Value_t is the market value of the investment, which private sector institutional investors generally estimate at least once each year by engaging the services of an independent, third-party appraiser at the conclusion of period t. By applying this procedure, unrealized gains are equivalent to realized gains, and balance sheets have no hidden values (Binkley et al. 1996).

Periodic valuation of the entire land asset portfolio allows land managers to develop a "big picture" of the portfolio of land assets under management and create a strategic plan for future portfolio development (AIS 2000). Equally important, a significant portion of the financial return from land assets occurs from asset appreciation. Appreciation may result from increased commodity prices, zoning, and other factors, and is important when considering financial strategies and trade-offs (AIS 2000). Some of the other factors affecting changes in land value are cost changes and accumulated inventory (McKetta, review comments).

Because the change in value of assets is such an important component of total return and the scope of assets held by state trust land managers members is

so broad, it is appropriate to focus on issues of valuation (AIS 2000). Value is much harder to measure than current return and measurement methodology is subject to considerable variation. At times, values can decline. But, it is only by including asset value changes in total return that the true measure of financial rewards is visible (AIS 2000).

Consider the value of a stock that pays no dividends because it reinvests all its profits in its current business (AIS 2000). It provides no current income but as the company grows, the stock becomes more valuable. Ignoring the change in value, and in this example growth, ignores all the benefits of owning that stock. On the other hand, the current return from an asset that is depleting, such as an oil well, is high, but in the future the well will eventually run dry and cease to provide any income at all. This is an example of negative growth (AIS 2000).

Most states that were surveyed reported valuing their land assets at the time of sale or exchange by either independent or in-house appraisers (AIS 2000). Other states reported assessing the land values at the initiation or renewal of a lease. Some states reported using the tax assessed value of the land as the appropriate value for transaction purposes. Montana is one such example (Montana DNRC 2000, see **Part 4.4.3**). Other states reported using university extension resources and data on farm and rangeland values for asset valuation (AIS 2000).

Rather than reacting to the asset valuation needs required for an individual transaction, some states reported that they proactively assess the value of their entire land portfolio on a periodic basis (AIS 2000). For example, Colorado is in the process of preparing a Request for Proposal for a third party valuation of its assets. According to the AIS (2000) report, Idaho, Washington, and Oregon have contracted for a third party valuation of their land and asset portfolio. The valuation was an important input into the development of a detailed asset management plan in Washington and Oregon. The AIS (2000) report said Idaho intends to value its land and asset portfolio every five years.

A concern for land managers is that often asset values look too high in relation to the income yield (AIS 2000). This may mean that the natural capital is underutilized (McKetta, review comments). It also may mean that income production is too low (Wiggins, review comments). In other cases this may mean that the asset is really worth much less than the stated value (AIS 2000). State land managers are faced with valuing large, often isolated and landlocked parcels that may not be comparable due to parcel size, access or location (AIS 2000). This helps rationalize using an *income capitalization* approach to valuation (Keegan, review comments).

3.4.3. Citizens' Committee Valuation Method Recommendations

The Citizens' Committee (2001) report recommended to the Land Board a particular target rate and a method for evaluating return on assets as part of the "Investment Goals" for endowment lands. In many ways, these and related recommendations represent the bottom line conclusions in the Citizens' Committee report.

These recommendations, provided in **Appendix E**, are starting points for determining how to evaluate forestland and rangeland asset performance, and are subject to further considerations. For example, the 6% target rate of return, 10-year holding period, and valuation formulas were chosen by the Citizens' Committee because they are the parameters used by private institutional investors.

Perhaps the most important recommendation is the use of a discounted cash flow method of appraisal for all land asset classes. Especially noteworthy is that the target rate is also the discount rate used for appraisal of land asset value.

3.5. Portfolio Theory and Application to State Trust Lands

Idaho's endowment lands comprise a significant real estate portfolio consisting of:

- timbered real estate,
- grazing real estate,
- mineral real estate,
- cottage site real estate, and
- commercial real estate

(Citizens' Committee 2001).

There are also croplands in the portfolio (Wiggins, review comments). The purpose of the Citizens' Committee (2001) report is "to explain some real estate investment fundamentals and strategies, and show how they can be applied to the Real Estate Portfolio owned by the State Endowments." An extensive investment portfolio, real estate or otherwise, will be diversified. Different property types are affected by different factors at different

times. By owning different property types, risk from market conditions that may negatively affect one property type at any point in time is reduced (Citizens' Committee 2001). For example, at some periods in the past, timberland investments have tended to move countercyclically with stocks and bonds, and independent of the real estate sector, thus timberland can perhaps provide portfolio diversification (HTRG 2001). These concepts are examined in more detail in **Part 4.7**.

In general, investments in land have less volatility in value, less variability in income and a lower risk profile, than most common stocks (AIS 2000). In one sense, the state trust land manager, locked into specific land parcels, may say that risk is not a variable worth considering as the land in most cases cannot be liquidated or its use easily changed. Still, risk is important to take into consideration, as the return from resource investments will, from time to time, be compared to other investments, particularly stocks and bonds. It is in this context that land may have a lower return, but when risk, i.e., variability in value and income, is taken into account, land may provide a higher, risk-adjusted return (AIS 2000).

3.6. Environmental and Social Values in State Trust Lands

Financial values are measured in monetary units. Economic values include financial values, and also environmental and social values. Many environmental and social values are not easily measured or defined in monetary units, in large part because they are not traded in a market. Non-market values will to some extent affect how state trust lands are managed.

A conventional wisdom has evolved regarding appropriate indicators of financial performance; however, the development of appropriate indicators of environmental and social performance is less advanced (AIS 2000). The problem lies mostly in technical difficulties in accurate valuation of non-financial or intangible benefits and costs (McKetta, review comments).

The impacts of trust land managers' decisions affect surrounding environments (AIS 2000). Local employment and local communities are also affected. These factors may affect the long-term financial well-being of the land trust (AIS 2000). This section provides some general ideas for developing environmental and social performance indicators that could be useful for trust land managers.

3.6.1. Tempering "Maximum Long Term Financial Return" with Other Values

The Citizens' Committee (2001) report made it clear that Idaho state trust lands are to be managed to provide "maximum long term financial return" as mandated by the Idaho Constitution. The committee recognized not only the importance of long-term economic benefits (not just financial benefits) but also environmental principles and values:

> Maximizing the long-term economic benefits to the Endowment is the primary objective in managing the trust lands. The management of trust lands shall incorporate sound environmental principles with consideration of impacts on wildlife, water and air quality, and soil conservation. Respecting the desire to maintain environmental quality, the Department of Lands shall strive to use the best and highest management standards commercially and economically feasible while meeting or exceeding the performance objective (Citizens' Committee 2001).

The position of the Idaho Department of Lands is that non-financial values are important because they contribute to sustaining the maximum income for trust beneficiaries (Wiggins, review comments).

3.6.2. Social Demands and Valuation

Specific sites or regions within a state may become sensitive areas due to proximity to a population center, presence of endangered species, or existence of old mine sites (AIS 2000). Cultural sites of American Indian tribes are also important considerations.

Management may decide to establish specific monitoring and performance programs requiring the collection of data over a number of years in order to develop trend lines and conduct further analysis of sensitive land areas (AIS 2000). With additional data on sensitive land areas, managers can estimate the opportunity costs of managing such areas for non-financial values. Sensitive areas arouse public opinions, and the additional costs of dealing with disgruntled citizens as well as potential litigation are worth some consideration. For example, endowment lands in the Priest Lake viewshed are managed differently than lands not in the viewshed, at a considerable opportunity cost to the beneficiaries (Wiggins, personal communication).

3.6.3. Environmental and Social Considerations as Additional Decision Criteria

The primary management objective of Idaho's endowment lands is to provide "maximum long term financial return" to the beneficiaries. Non-financial environmental and social values represent opportunity costs, or revenues foregone. If managers determine that scenic values or wildlife habitats in an area are important, the fiduciary responsibility of trust managers remains one of undivided loyalty to the beneficiaries. Managers must act prudently to meet this obligation. If managers determine that revenues are to be foregone in order to provide or protect non-financial values, the decision can be reported as part of the asset management plan.

To meet the needs of the state trust land beneficiaries, the management decision process must include basic measures in the form of financial criteria and indicators (AIS 2000). These should include basic indicators of changes in measurable financial benefits, including return on asset value. In addition, environmental and social performance measures chronicle long-term and cumulative impacts on the land. These criteria and indicators can be described as having either a positive, negative, or neutral impact on future cash flow and asset value (AIS 2000).

Potentially useful financial, environmental, and social criteria and indicators can be arrayed in such fashion that management options can be compared using these criteria (Table 3-1). Table 3-1 provides examples of criteria and indicators recommended in the listing provided in the AIS (2000) report to the Western States Land Commissioners. These performance measures are basic means to measure gain or loss, usually measured on the total portfolio, groupings of similar assets, or on a regional basis (AIS 2000).

Table 3-1. Criteria and indicators for evaluating trust land management options.*

Financial Criteria and Indicators	Baseline	Option A	Option B	Option C
Net income generated	n.a.	*	*	*
% increase (or decrease) of net income from prior year(s)	n.a.	*	*	*
% resource management expense of total revenue	n.a.	*	*	*
% total return on assets (net income + land appreciation)	n.a.	*	*	*
Environmental Criteria and Indicators				
Soil erosion / compaction	n.a.	*	*	*
Specific levels of pollutants (i.e., water quality)	n.a.	*	*	*
Habitat quantity or quality	n.a.	*	*	*
Land productivity (i.e., timber or forage yield per acre)	n.a.	*	*	*
Social Criteria and Indicators				
Net income generated for schools	n.a.	*	*	*
Recreation days / year	n.a.	*	*	*
Economic diversity index[#]	n.a.	*	*	*
Community outreach[£]	n.a.	*	*	*

For each option analyzed, fill each cell with one of the following symbols: n.a. = not applicable (baseline column only); * = no data available; n.c. = no change from baseline; ++ = large increase from baseline; + = small increase; - = small decrease; and -- = large decrease from baseline).

[#] For example, the reciprocal of the share of the total local employment in the natural resources sector in the region (AIS 2000).

[£] For example, the number of persons attending meetings/year or use of surveys to determine community interest and understanding (AIS 2000).

Source: developed from *Trust Performance Measurement* (AIS 2000).

When viewed over time, performance measures assist both the trust manager and the beneficiaries in understanding and quantifying trends (AIS 2000). An understanding of the relationship between financial, environmental, and social factors will assist both the manager and beneficiary, and when required, will assist in explaining policy and programs to local and statewide political leadership, as well as to the general public (AIS 2000).

The environmental criteria and indicators need little explanation (Table 3-1), except perhaps for species protected by the federal Endangered Species Act. Prudent judgment on the part of managers is needed to protect habitat. If endowment lands have been designated by federal agencies as "critical habitat" for threatened or endangered species, then the primary management objective of such lands is for the protected species, which in some cases may preclude other land uses. It is the manager's responsibility to know if there is critical habitat within his/her area of operations. Although all threatened and endangered species should have designated critical habitat, the U.S. Fish and Wildlife Service has not considered this a high priority, so the majority of protected species, including wolves and grizzly bears, do not have designated critical habitat. Even if critical habitat has not been designated, the manager must not "take" an endangered species, a term that includes adverse modification of habitat for endangered species, and in most cases threatened species as well (see PAG Report #13, O'Laughlin and Cook 1995).

Social criteria and indicators need some explanation (Table 3-1). The economic diversity of a region is likely the most important component of a socio-economic performance index and may also be used as a proxy of the socio-economic resilience index (see Horne and Haynes 1999) for simplicity when there are data limitations (AIS 2000). This measures the diversity of local employment in different sectors of the economy. For example, if there is one dominant industry in the region, say the forest products industry, which employs 75% of a region's labor force, then this region has less economic diversity than a region whose dominant industry employs 50% of the labor force. An example of an economic diversity index would be the reciprocal of the share of total local employment in the natural resource sector in the region. Thus, the higher the economic diversity index, the smaller the dependence of the region on the resource sector (AIS 2000).

Social and cultural diversity might be represented by the ethnic or migrant composition of the inhabitants of the region, or lifestyle indicators such as recreation and leisure activities. Civic and amenity infrastructure in a region can be represented by the population density of the region (Horne and Haynes 1999). So, by multiplying the population density by the variation in predominant lifestyle indicators and the economic diversity index it is possible to derive an index for socio-economic resilience. The greater the resilience index, the more able a community is to adapt to socio-economic changes from trust land management policies (AIS 2000).

3.6.4. Mission Statement and Managerial Mindset

Both the AIS (2000) report to the Western States Land Commissioners Association and the Citizens' Committee (2001) report to the Idaho Land Board commented on the relationship between agency mission, managerial mindset, and performance. The ideas in those two reports are discussed in this section.

Often, one of the first tasks for a resource management organization is to think about a succinct mission statement that is clear, meaningful, and summarizes for all stakeholders—i.e., beneficiaries, government, and management staff—the primary function of the organization (AIS 2000). From such a simple statement flow strategic plans and goals and measurement of performance.

The AIS (2000) report to the Western States Land Commissioners Association included as a starting point for developing a mission statement a modified example statement paraphrased from the mission statement taken from a very large owner of pasturelands, which read:

> *To manage (state trust) lands in an economically sustainable and ecologically sensitive manner (for the beneficiaries)*(AIS 2000).

The Idaho Department of Lands was created by the Idaho legislature in 1905 to assist the Board of Land Commissioners in carrying out its constitutional duties (IDL 2000b). That original purpose remains the same today, and the Department's mission statement echoes that of the Land Board:

> *We manage endowment trust lands for the beneficiaries and protect natural resources for the people of Idaho* (IDL 2000b).

The mission statement of the Idaho Department of Lands is similar to that recommended in the AIS (2000) report to the Western States Land Commissioners Association, quoted above. One difference is that IDL "protects" natural resources, whereas the AIS (2000) report recommends a statement about ecological sensitivity.

According to the Citizens' Committee (2001) report, the prevailing attitude in the Idaho Department of Lands is that managers are "stewards of the Land" (Box 3-2). The committee believes managers' first thought should be that they are responsible to the endowment beneficiaries for obtaining the "maximum long term financial return." To do that, managers need to maintain the health and long-term viability of those properties so that they can provide a substantial financial return to the Endowments over the entire investment horizon (Citizens' Committee 2001). The appropriate time horizon for state trust lands is perpetual (Souder and Fairfax 1996).

The Idaho Department of Lands agrees with the Citizens' Committee (Wiggins, review comments). Indeed, for more than two decades IDL staff always has had a clear understanding that their job was to manage the endowment lands to generate revenue for the beneficiaries, subject to the concepts of sound land management, or "stewardship," within the social constraints that existed, such as considerations that Priest Lake resources are "crown jewels" (Hamilton, review comments). Even so, in keeping with the mission statement, the prevailing attitude was to generate revenue for the beneficiaries through the application of sound resource management practices (Hamilton, review comments).

3.6.5. Third Party Certification

Certification of land management by a third party utilizing a combination of financial, environmental, and social factors can provide additional criteria for measuring performance (AIS 2000). The role of an auditor in approving financial records is a well-established procedure. Certification is similar to auditing and is being tested and applied to the management of natural resources, specifically forest lands (AIS 2000).

A recent Policy Analysis Group report analyzed forest certification programs (PAG Report #18, Cook and O'Laughlin 1999). These programs are in their infancy. The key to certifying that forest lands are "well managed" depends on the selection of appropriate financial, environmental, and social criteria, identification of indicators that represent the criteria, and development of standards that can be used to make judgments as to what the indicators reveal about management practices (Cook and O'Laughlin 1999). For example, indicators of financial performance would include return on assets; standards would include the target rate of return.

Box 3-2
Managerial Mindset: Citizens' Committee Concerns

A subtle semantic difference can have a big effect on attitudes and outcomes. Instead of managing the Lands for the long-term health and benefit of the *lands*, [Department of Lands] needs to be managing the Lands for the long-term *financial return to the Endowments*. This will be an important, difficult, but necessary responsibility of the Director to shift the departmental mindset in this way.

The State Endowment Lands actually comprise an extensive and varied Real Estate Investment Portfolio. These lands are owned by the State Endowments. They are not owned by the State of Idaho or its citizens. At this time, the returns to the Endowments and their Beneficiaries are significantly below the benchmark rates of return that can be obtained by other investments.

Part of this shortfall results from the current mindset held by both the Land Board and the Department of Lands. They see these lands as the "crown jewels of Idaho" and should be protected and preserved for the benefit of the State and its citizens. In actuality, the mindset needs to be shifted to see that these lands are valuable Real Estate Assets that need to be actively and intensively managed to provide the maximum possible financial return to the Endowments on a long-term basis.

Source: Citizens' Committee (2001) report to the Land Board.

The end result of certification is a statement from the certifying organization that the lands audited meet the standards for "good" management set by the certifying organization. One of these organizations, the Forest Stewardship Council (FSC), provides that consumer products manufactured from timber harvested from certified lands can be imprinted with a label indicating that the products meet FSC standards for good forest management. Several retailers, including Home Depot and Lowe's, have a favorable attitude toward marketing wood products with a certified label. In the future, market demand for certified forest products may lead to price premiums, but so far that has not happened (Cook and O'Laughlin 1999). Nevertheless certification has some benefits.

Certification by a third party provides public and private visibility and credibility, as well as expertise that may not be available in-house (AIS 2000). Although certification procedures have been principally applied to the management of forested lands, the same approach could be applied to range or crops lands (AIS 2000).

Several state agencies have had their forest lands certified, including Pennsylvania, New York, and Minnesota (Cook and O'Laughlin 1999). Washington and Wisconsin reported in 2000 that they are considering having their forests certified (AIS 2000). In the future, demand for certified wood products by consumers and retailers may increase the attractiveness of certification. Barriers to third party certification today include the lack of data on various criteria and indicators of sustainability, lack of widely accepted regional standards, competing programs, lack of consumer demand translated into premium prices for certified forest products, and costs to the landowner. However, the costs of implementing a third party certification plan are likely to be low in states that already have existing long term management plans (AIS 2000).

Third party certification is a reasonable undertaking on Idaho's endowment forest lands (Hamilton, review comments). In 1998 the Pinchot Institute offered to pay the cost of having endowment forest lands certified by two different certifiers in order to evaluate or "calibrate" the differences in the two certification approaches. The IDL considered the proposal, but decided to defer action until their "customers" told the Department they needed certification (Hamilton, review comments).

3.7. Summary and Conclusions

Evaluating the performance of trust land assets begins with a financial analysis. The procedures are the same as with any investment: the anticipated future cash flows are discounted to a present value using a guiding or target interest rate. Selection of the appropriate target rate is an important policy decision that affects perceptions of performance and makes a statement about how the organization values the future in relation to the present. The higher the target rate, the less value the organization places on future events. For this reason, some analysts suggest that public agencies use a lower discount rate than private organizations, who will generally use their cost of capital plus an adjustment for risk. A target rate somewhere in the range of 3% to 7% seems appropriate. Until such time as the Idaho Department of Lands and the State Board of Land Commissioners develop some experience in how the selection of a target rate will affect land management decisions and perceptions of managerial performance, analysis can be done with a range of rates.

Discounted cash flows provide an estimate of the present value of an investment. Cash flows based on land management activities can be used to calculate a land expectation value, which is an appraised value for land assets using an *income capitalization* approach. This appraisal method is appropriate when information about *comparable sales* of similar properties are not available. Discounted net income appraisal is the only appropriate valuation method for Idaho endowment forest lands and rangelands.

A "total return" approach to land asset performance evaluation includes the change in the land asset value as well as the net income from land-use activities. The total return approach is used by institutional investors in timberland, such as pension funds, and is the method recommended in forest and range economics literature.

The endowment lands have a primary goal of providing "maximum long term financial return" to the beneficiaries. Environmental and social values also are to be considered in management plans, but the basis for performance remains financial. Specific methods for evaluating financial performance are provided in **Part 4** for forest lands and **Part 5** for rangelands.

Part 4. Forest Land as a Financial Asset

Forests are a store of wealth, or capital. A forest is somewhat like a certificate of deposit or a stock you buy with the hope that, over time, your financial investment will return more money than you paid for it (Klemperer 1996). Forests, of course, are much more than a financial asset because they provide an array of other benefits with values that cannot be measured in monetary terms. Some of these are extremely valuable to individuals, organizations, and society (Bullard and Straka 1998). Viewing forests as financial assets is a useful framework into which non-monetary values can later be woven (Klemperer 1996).

Idaho's endowment forest lands in 1999-2001 provided net income of $61 per acre per year from timber sales. Is this level of income an adequate financial return on the value of the land asset? That depends on the value of the asset. In this part of the report we develop and apply an *income capitalization* appraisal approach. Results presented show actual net income in the 1999-2001 period provided a return on assets of 5.7% based on a land expectation value (LEV) averaging $1.063 billion at a 4% discount rate, or $1,069 per acre; at a 6% discount rate LEV averaged $709 million, or $713 per acre, and resulted in a return on assets from timber income of 8.5%.

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Some forest landowners are interested mainly in financial returns and hold the land for that purpose (Klemperer 1996). The State of Idaho owns forest lands with financial return as a primary management objective, to meet the mandate of the Idaho Constitution that these lands are to provide "maximize long term financial return" to public schools and the other public institutions designated as beneficiaries of these trust lands. Timber from the endowment lands has provided considerable financial returns to the public schools. In the past two decades, timber returns have helped increase the value of the Permanent Endowment Fund from $235 million to $800 million (IDL 2000b). With adequate investments to actively manage endowment forest land assets, substantial financial returns may be expected from these lands in perpetuity.

Investments in forest management include investments in protection (from wildfire, insects, diseases, and other depredations), in various management practices (e.g., planting trees), in infrastructure such as access roads and recreation facilities, and in developing management information (NRC 2000). The most significant investment is usually in the trees themselves, whether they are held for timber production or for other purposes. The value of the investment increases with the age and size of the trees. Most forestry is very capital intensive because of the long time periods involved. Investments are also required to provide non-wood products such as wildlife. Such investments include the opportunity cost of holding timber inventories off the market to protect riparian areas and other special wildlife habitat, to provide for landscape and other amenities that are attractive to both active and passive users of the forest, and to provide for the production of such miscellaneous forest products as mushrooms and ornamental vegetation. Just as there are opportunity costs in holding valuable timber off the market to obtain these non-timber benefits, there are opportunity costs associated with losing non-timber benefits to obtain the financial value of timber harvests. The opportunity cost concept applies to public and private forest owners (NRC 2000).

To understand the forces behind forestry, one needs to understand business and management in general because forest management is a business, and a segment of the total business community (Davis 1966). Business and market forces also apply to the management of public lands. Raw materials from forest lands are sold and processed, and the final products distributed, in competitive markets. Demands for recreation, wildlife, water, and other non-timber products also stem from the general economy and are part of it. Although forestry affairs are in some sense different or separate from other economic affairs, there are areas of similarity (Davis 1966). Some of the things that are either peculiar to or of particular importance to the forestry business are presented in Box 4-1.

Box 4-1
Attributes of Forestry as a Business

- The extreme length of the production period. Few if any other businesses normally deal with a product that takes decades, or even a century or more, to grow.
- The necessary identification of the "Factory" (i.e., the tree) with the marketable product. In a shoe factory, for example, one cannot use up part of the factory itself to make more shoes. This can be done in forestry, as there is no clear demarcation between growing stock, which for the most part is also marketable inventory, and the product that could be currently harvested.
- The very high ratio between marketable inventory and products currently cut, often 15 or 25 to 1; i.e., there may be 15 to 25 merchantable volume units available in a forest to every 1 that should be harvested annually. This leads to a constant temptation to cut down trees that could be left standing for growing stock.
- Raw material supply and inventory control are particularly critical considerations for firms that process timber into consumer products.
- Cyclical variations in demand for forest products are often wide.
- Capital requirements are extremely high. Few other industrial groups even compare with commercial forestry in investment requirements.

Source: *Forest Management* (Davis 1966).

4.1. Rate of Return Components: Biological Growth, Timber Stumpage, and Land Value

Financial returns from forest land assets are the result of biological growth and timber "stumpage" value, plus change in the value of land upon which the timber grows. The value of forest land generally is determined by the timber growing potential of the land, the strategies for and investments in managing the timber growing stock inventory, the timber stumpage market, and the owner's guiding interest rate. Forest lands that are capable of sustaining marketable crops of trees generally are referred to as timberlands.

Timberland is a tangible asset that over the long run has provided respectable, but not spectacular, investment returns (Zinkhan et al. 1992). The primary engine producing investment returns is biological growth—not financial sleight of hand or speculation. Revenues derived from the proceeds of timber harvests may be viewed as a series of contractual arrangements. The owner sells live trees, called stumpage, to a buyer who in turn arranges with logging contractors to cut the trees and haul the logs to a mill or forest products manufacturing facility. The timing of timber sales is obviously an important determinant of the investment return because stumpage prices fluctuate over time and can vary significantly depending on the diameter of the trees and costs of harvesting them. Historically, stumpage prices have been higher per unit of volume for larger-diameter trees than they are for smaller ones (Zinkhan et al. 1992). However, premiums for the largest diameters are declining (McKetta, review comments). Recently some mills have paid premiums for smaller logs (Wiggins, review comments).

The value of forest land generally is determined by the timber growing potential of the land, the strategies for and investments in managing the timber growing stock inventory, the timber stumpage market, and the owner's guiding interest rate.

The size of a tree is a function of site productivity, age, and management strategy. The investor must therefore consider the trade-off between the cost of owning the trees for additional years and whatever price differential may be expected from the sale of larger-diameter trees (Zinkhan et al. 1992).

4.1.1. Biological Growth

A forest is probably the only asset that visibly gets larger and more valuable even when neglected (Vardaman 1989). Jon Caulfield, a professor of forest finance, said, "It doesn't matter what Alan Greenspan does or what happens in Yugoslavia. Prices can go down but biological growth buffers it and always pushes returns in a positive way" (Denmark 1999).

Each year a tree adds an annual growth ring, an increment of wood that accumulates on the trunk or bole of the tree (Figure 4-1). A cross-sectional view (Figure 4-1(a)) reflects only a portion of the layer of wood that is added to the entire tree (Figure 4-1(b)). Each year, this increment of growth is added to the entire tree, somewhat like stacking long, thin inverted ice cream cones of increasing size, one on top of another (Figure 4-1(c)).

Growth in the size or volume of individual trees,

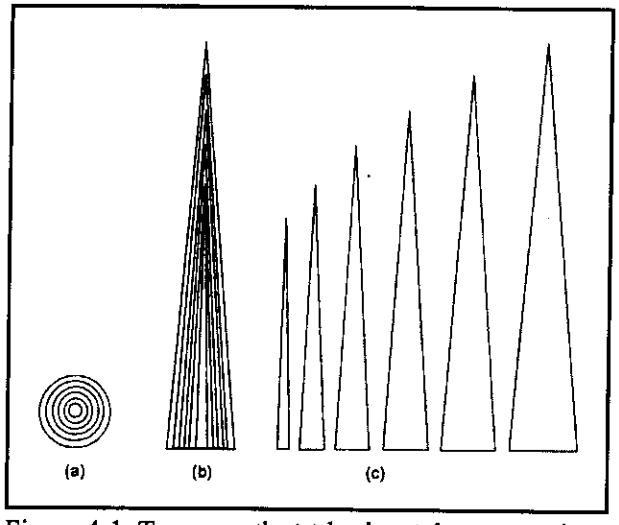

Figure 4-1. Tree growth: (a) horizontal cross-section of tree trunk, showing annual growth rings; (b) vertical cross-section, showing annual growth increment as a thin layer of wood added each year; and (c) annual growth increments.

and stands of trees, is a function of the ecological conditions of the site that affect productivity. Site index is a proximate measure of productivity. Other factors affecting timber stand growth are the number and basal area per acre of desirable trees per acre, and the basal area of competing undesirable trees, as well as the age and condition of the stand (Zinkhan et al. 1992).

Trees grow and accumulate size according to a sigmoid or S-shaped curve (Figure 4-2, broken line). Size is usually measured by either tree height or diameter of the tree trunk, most often at breast height, or 4.5 feet from the ground. Wood volume in the tree trunk is a function of height and diameter, and is determined by various equations that account for the vertical taper of the trunk. The rate of size growth increases very rapidly in the early years, peaks, and slows down as the trees get older (Figure 4-2, solid line). The S-shaped form of the cumulative growth curve shows the size of the tree at any age. This S-shaped curve is evident for individual cells, tissues, and organs, and for individual plants and animals for the full life span. Also, the pattern of growth for short growing periods, such as a growing season, tends to follow the S-shaped curve (Husch et al. 1972).

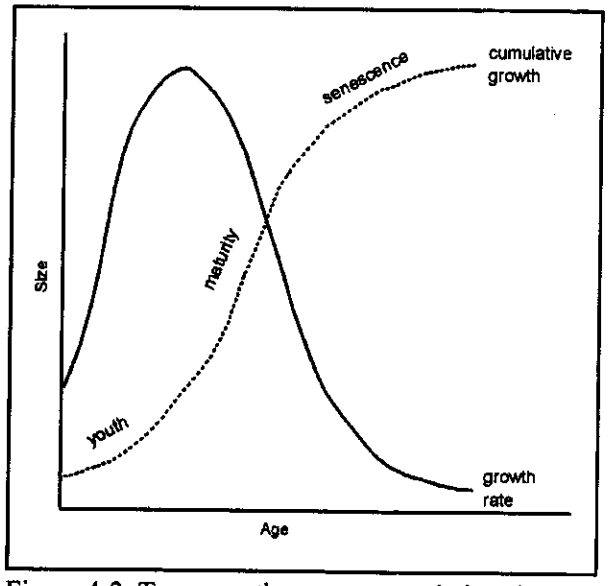

Figure 4-2. Tree growth curves: cumulative size growth, with life stages (broken line); and rate of growth (solid line).
Source: *Forest Mensuration* (Husch et al. 1972).

The growth rate curve (Figure 4-2, solid line) during the youth stage of a tree's life increases rapidly to a maximum at the point of inflection in the cumulative growth curve (Figure 4-2, broken line). Acceleration of the growth rate first increases and then drops to zero at the point of inflection in the growth curve. During the maturity and senescence stages, the growth rate decreases (Figure 4-2, Husch et al. 1972).

The growth increment may be expressed as an annual growth rate, which will be higher when trees are young and more vigorous. Because tree volume is proportional to cross-sectional area as well as height, one year's growth ring of the same width becomes a smaller percent of the tree volume as tree age and diameter increases (Klemperer 1996).

As shown by cross-sectional views of two trees (Figure 4-3), a decline in annual growth rate is a result of the way tree growth rates are measured rather than the slight decrease in the width of the annual growth ring as trees age. The hatched areas represent one year's growth ring of the same width. One ring on the larger tree is a much smaller percentage of the cross-sectional area than is one ring on the smaller tree. During one year, the percentage increase in cross-sectional area is roughly the same percentage increase in merchantable tree volume. Thus the volume added by the growth ring represents a smaller percent of tree volume as trees get larger (Klemperer 1996).

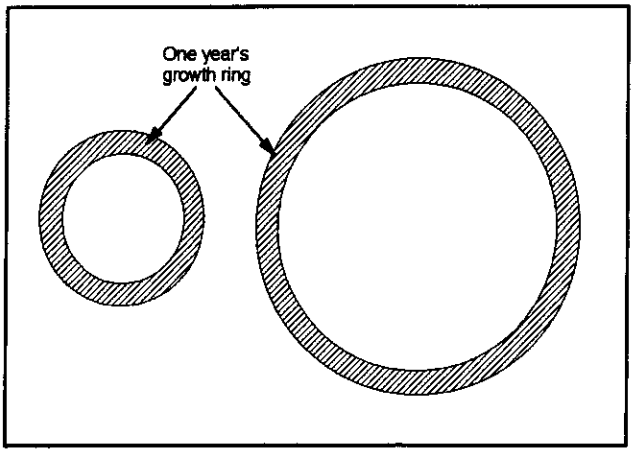

Figure 4-3. Comparison of two annual growth rings of equal width on a small and large tree.
Note: One year's growth ring adds more than twice as much cross-sectional area to the larger tree; however, the rate of growth of the smaller tree is more than twice that of the larger tree. The ring on the smaller tree adds 86% to cross-sectional area whereas on the larger tree, a ring of the same thickness adds 35% more cross-sectional area.
Source: *Forest Resource Economics and Finance* (Klemperer 1996).

For example, the increment of annual growth added to the smaller tree in Figure 4-3 represents an increase of 20 units of area, an increase of 86% in total cross-sectional area. A growth ring of the same width on the larger tree represents an increase of 42 units of area, but is only a 35% increase in total area.

The growth rate helps managers determine when trees should be cut. Physical volume is converted into value by applying unit values to the accumulated volume. A tree's percentage value growth rate will eventually decline with age, as does the physical growth rate (Klemperer 1996). When this percentage change includes land value and incorporates annual revenues and costs of management, it is called "forest value growth percent." Because forests are capital assets, percentage growth rates in wood volume in the forest and its corresponding value are of considerable importance to investors (Klemperer 1996). A simple rule is to cut trees when the forest value growth percent exactly equals the guiding rate of return (i.e., the discount rate or target rate). We revisit this important concept in **Part 4.3.2.** and again in **Part 7.2.3**.

Tree, Stand, and Forest Level Information.
Timber managers are concerned less with individual trees than with aggregations of trees. A stand of trees is a contiguous group of trees sufficiently uniform in age-class distribution, composition, and structure, and growing on a site of sufficiently uniform quality, to be a distinguishable unit (Helms 1998). Because of such uniformity, the growth of stands has characteristics similar to the growth of trees.

Stands of trees are aggregated at a forest unit level for management planning purposes. In **Part 4.4.4** we present the land expectation value (LEV) as a method to estimate the value of the endowment forest lands as a single forest management unit. Inventory data for forests are generally available by general ownership classifications at the state level, in part to avoid disclosure of proprietary information on individual private land ownerships. The Idaho Department of Lands conducts periodic inventories of endowment forest lands. This investment in information is the basic building block of a forest management information system upon which prudent decisions can be based.

Forest inventory data for all non-federal forests in Idaho is collected at ten-year intervals by the research branch of the U.S. Forest Service. The last such inventory for Idaho non-federal forests was conducted in 1991 and published for northern Idaho (Wilson and Van Hooser 1993) and southern Idaho (Chojnacky 1995). An inventory report on all forests

in Idaho, including national forests administered by the U.S. Forest Service and public lands of the Bureau of Land Management (BLM), has also been published based on 1991 data (Brown and Chojnacky 1996). The state-level report unfortunately combines state timberlands with BLM timberlands in an "other public" ownership classification, but the northern and southern Idaho reports can be used to separate out State of Idaho lands.

We use state-level U.S. Forest Service inventory data several ways, including an assessment of the annual growth rate by ownership classification (in the next subsection) and the rate of inventory turnover (RIT) by ownership classification, a financial performance measure that reflects capital efficiency as it relates to timber management strategy (see **Part 4.6**).

Idaho Growth Rates. In any of the three major forested areas of the West, timber growth rates can be quite varied (Zinkhan et al. 1992). Growth rates vary greatly according to the age of the timber, the quality of the site, the intensity of forest management, and various other factors. For example, old-growth stands, many of which are managed by the U.S. Forest Service, have low or negative net annual growth rates. For the West as a whole, the softwood inventory controlled by non-industrial (or "other") private forest landowners has an average annual growth rate of 2.4% per year compared with only 0.9% per year for federal government-controlled softwood (Zinkhan et al. 1992). These aggregated statistics for private lands include intensively-managed industrial tree farms as well as neglected woodlots.

Idaho timber inventory growth rates vary by ownership class or group (Table 4-1). In 1991 the "other private" owners class had an average annual growth rate of 4.0% per year, compared to 3.4% for forest industry, 2.2% for national forests, and 2.6% for State of Idaho endowment lands, which included primary and secondary forest lands. These annual forest growth rates are net of annual mortality, but do not include any adjustments for timber harvesting. In 1991, mortality rates on State of Idaho and national forest lands were considerably higher than on private lands. The higher growth rates on private lands reflect different forest types, management regimes, and lower growing stock volumes per acre, which likely indicate younger-aged forests. Forest industry firms had lower net annual growth than did other private owners, probably because their forests were older (Table 4-1).

Some of the most productive timberlands in the nation are in northern Idaho (Wilson and Van Hooser 1993). In the southern U.S., however, average growth rates are higher because of climate, control by the private sector, relatively young age of the timber, and numerous other factors. For example,

Table 4-1. Idaho sawtimber inventory statistics by ownership classification, 1991.

	Ownership Classification			
	State of Idaho	National Forest	Forest Industry	Other Private
Timberland acres	968,255	12,808,474	1,239,464	1,934,489
Sawimber inventory growing stock volume (mmbf)	8,481	109,598	8,620	11,067
Sawimber inventory per acre (board feet)	8,761	8,557	6,957	5,722
Net annual growth (mbf)	223,922	2,414,983	292,564	447,592
Net annual growth per acre (board feet)	231	189	236	231
Net annual growth rate (%)	2.6%	2.2%	3.4%	4.0%
Annual mortality (mbf)	63,481	818,761	50,591	58,742
Annual mortality per acre (board feet)	66	64	41	30
Annual mortality rate (% of growing stock volume)	0.8%	0.8%	0.6%	0.5%
Annual mortality rate (% of gross growth)	22.2%	25.3%	14.8%	11.5%

Abbreviations: mbf = thousand board feet; mmbf = million board feet (Scribner Scale).
Source: all data from U.S. Forest Service forest inventory and analysis reports (all data from Brown and Chojnacky [1996], except State of Idaho data from Chojnacky [1995], Wilson and Van Hooser [1993]).

the other private ownership class had an average annual growth rate of 6% across the South, compared with 2.4% throughout the West and 3.4% in the North (Zinkhan et al. 1992). Well-managed timberlands in the southern U.S. can provide annual returns to investments ranging from 6% to 8% over the long run from biological growth alone, without any stumpage price changes (Vardaman 1989). However, the physical growth of timber rarely exceeds 8% annually, thus real rates of return of more than 8% annually from tree growth alone are nearly impossible (Vardaman 1989). Attainable Idaho growth rates are revisited in **Part 4.3.2** in the context of the target rate of return concept.

Product Ingrowth. In addition to mature timber and the underlying land, immature timber growing stock is another component of an investment in timberland (Binkley et al. 1996). As the diameter of the immature tree grows, the wood will become valuable when the tree reaches "merchantable" size. Value also may increase from one product class to another. Value per unit volume increases as a tree grows into the sawtimber size class. For example, Idaho pulpwood- or poletimber-sized trees (4 to 9 inches diameter at breast height (d.b.h.)) have less value per volume of wood than do larger sawtimber-sized trees (9 inches or greater d.b.h., Brown and Chojnacky 1996). Unless timber prices are rising sharply, the forest value growth rate percent ultimately declines (Klemperer 1996).

Large-diameter trees have traditionally been worth more per unit of volume than smaller trees because they can be manufactured into higher-valued products. When this happens, an investor benefits from two kinds of growth: biological growth in volume and economic upgrading from a lower-value commodity like pulpwood to a higher-value commodity like sawtimber (Zinkhan et al. 1992). Because the cost of processing them is generally less than small trees, larger sawtimber trees are more valuable per cubic foot than smaller ones even though they are manufactured into the same product, and further differences in value can arise from differences in the products that could be made from them (Vardaman 1989). Once a tree has reached sawtimber size (i.e., 9 inches d.b.h.), trees become more valuable as the quantity of board feet per cubic feet of timber volume increases, up until approximately 20 inches d.b.h. (Keegan, review comments). As trees grow from 9 to 20 inches d.b.h., logging costs also decline and product recovery in the sawmill increases. However, because mills are designed to process timber up to a particular size, timber buyers are unwilling to pay premiums for larger logs beyond that size (Keegan, review comments). For example, in northern Idaho the log price value curve flattens above 22 inches for ponderosa pine and above 18 inches for Douglas-fir (small-end log diameters; McKetta, review comments). In the future, there may be more demand for smaller timber as sawmills retool with new technology (Wiggins, review comments).

4.1.2. Timber Stumpage Value

"Stumpage" is the value of timber as it stands uncut, and is expressed as an amount per unit volume or area (Helms 1998). Timber is the raw material for numerous basic industries, and stumpage is timberland's primary economic output. Stumpage is what buyers pay for standing timber ready for harvest. The potential harvest income from standing timber is called stumpage value (Klemperer 1996).

Changes in stumpage prices are the second factor contributing to the return on timber or timberland investment. Stumpage prices are a function of demand and supply (Zinkhan et al. 1992).

Demand and Supply Factors. Stumpage, as the price at which timber sales transactions occur, is a derived function of the demand for lumber and other wood-based products and the supply of timber. In the past, demand factors have driven stumpage markets (Gregory 1987). Over the long term in the U.S., the relative (i.e., inflation-adjusted) producer price index for lumber has generally increased for 200 years, at an average annual rate of about 1.8% (data from USDA Forest Service 2000). Product prices become increasingly uncertain the further into the future projections go. Wood product prices have often dropped—sometimes drastically—and forecasts of prices even six months ahead are properly greeted with considerable skepticism (Gregory 1987). There have been periods of relative lumber price stability, such as the 1960s and 1980s. In the 1990s, lumber prices increased faster than an index of prices for all commodities (data from USDA Forest Service 2000).

Demand for timber is expected to increase as the U.S. economy and those abroad continue to grow (HTRG 2001). Timber supply was expected to exert a strong influence on stumpage price during the 1990s due to timber harvest restrictions on U.S.

public lands in the western states (Zinkhan et al. 1992). As the time series analysis of Idaho endowment timber stumpage prices in the next subsection illustrates, that is exactly what happened.

Idaho Stumpage Price Trends. Analysis of time series trends is useful for describing the historic rate of return component attributable to stumpage price and thus forest value change. Stumpage price is a function of timber and supply demand. The demand for sawtimber, the principle timber product from Idaho endowment lands, is driven largely by global housing construction activity. On the supply side, the 80% reduction in national forest timber sales during the 1990s in Idaho and throughout the Pacific Northwest had an effect. In the short run, less timber available in the market drove prices higher. In the long run, mill capacity will adjust to local timber availability, and prices will adjust downward (McKetta and Keegan, review comments).

Timber harvest stumpage prices for endowment lands timber soared beginning in the early 1990s, and have since adjusted downward (Figure 4-4). In Idaho three-fourths of the timber inventory is in national forests (Table 4-1). Throughout the 1960s, '70s and '80s national forests provided approximately 40% of the total timber harvest in Idaho. Now national forests provide less than 20%. Mill capacity has declined accordingly, as the difference cannot be made up by sustainable timber harvest levels on other ownerships (Cook and O'Laughlin 2000).

In Idaho, over the past 50 years constant or real (inflation-adjusted) stumpage prices for endowment

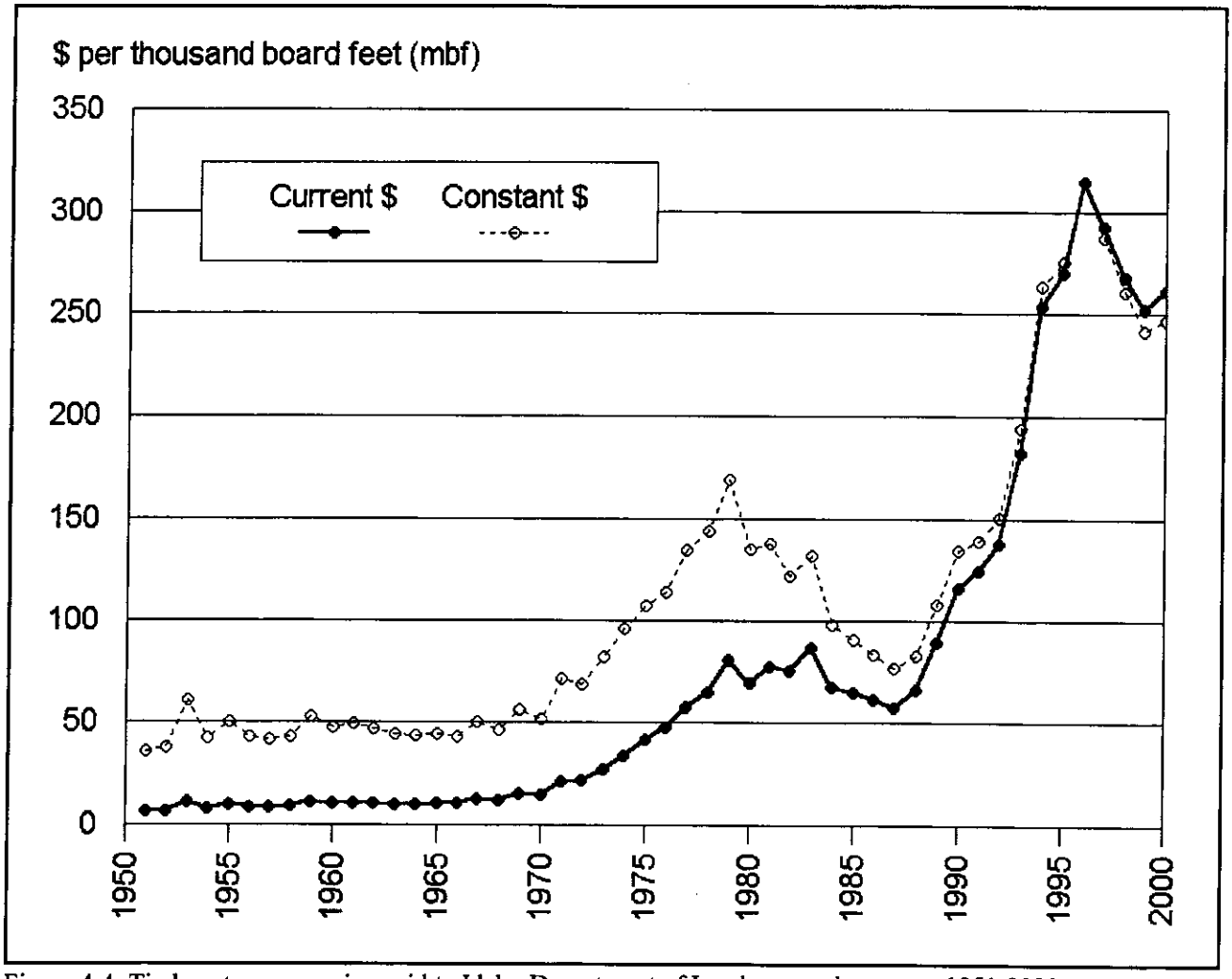

Figure 4-4. Timber stumpage price paid to Idaho Department of Lands, annual average, 1951-2000.
Note: Current dollars are adjusted to 1996 constant dollars (i.e., "real" or inflation-adjusted dollars) with the U.S. Department of Commerce GNP deflator.
Source: developed from data provided by Idaho Department of Lands (IDL 2000c).

lands timber have increased an average of 4% per year. Most of that increase occurred in the 1990s (Figure 4-4) due primarily to short run imbalances in local supply and mill capacity.

What will the future hold? The U.S. Forest Service 50-year stumpage price projections for the interior West region, where Idaho and Montana are the dominant timber states, anticipate real stumpage price increases of 3% per year until 2020, then prices are forecast to taper off until 2050 so that the average annual long-term real stumpage price increase over the next 50 years works out to 1.2% per year (data from USDA Forest Service 2001). The Department of Lands may want to use the conservative assumption that timber in the future will be worth what timber is worth today, and to use a 0% rate of stumpage price increase for timber management planning purposes, including the determination of the land expectation value for calculating return on asset value described in **Part 4.4.4**. Analysis in **Part 4.5** reveals the sensitivity of financial performance results to stumpage prices. Another alternative, in keeping with the suggestion in the AIS (2000) report to the Western States Land Commissioners Association, would be to develop the in-house capability to make credible timber market forecasts. For example, the Washington Department of Natural Resources has staff economists who forecast timber prices six years ahead, which assist in revenue forecasts for trust land beneficiaries (see, for example, Washington DNR 2001).

4.1.3. Land Value

Analysis of the rate of return on marginal investments in *timber* management, such as individual projects, generally does not consider bare *land* values. However, in order to compare timber*land* investments with other alternative opportunities, the *land* value must be taken into account.

Land prices in the United States have risen continually since the 17th century (Vardaman 1989). They may go up and down from year to year, but almost any 10-year period shows a sizable increase. It is reasonable to assume that this general trend will continue because the pressure of people on land makes prices rise, and our population is expanding (Vardaman 1989). Estimates are that the U.S. population is expected to increase 50% by 2050 (USDA Forest Service 2000). However, at a given place during a given time period land values might go up or down (McKetta, review comments).

Land value is the most significant single factor influencing timberland investment returns (Zinkhan et al. 1992). The price of the land component of timberland depends upon the "highest and best use" of the land, which is determined by the marketplace. If growing timber is the highest and best use for a given tract of land, its price should approach the present value of the estimated future stream of stumpage harvest revenues less periodic expenses discounted at some appropriate cost of capital (Zinkhan et al. 1992). In other words, the market price of timberland can be estimated by discounting net revenues using an *income capitalization* method of appraisal.

Estimating the value of forest lands for growing timber is problematic (Davis 1966; McKetta 1990; Hamilton, review comments). In **Part 4.4** we review the various *income capitalization* methods that have been used, and demonstrate the land expectation value (LEV) as an appropriate technique for appraising the value of endowment forest lands for the purposes of financial performance evaluation.

4.2. Forest Value Growth and Total Return Performance Evaluation

From a financial perspective, the components of forest value growth are timber volume, stumpage price, and land value. Forest value growth is similar to profits (Klemperer 1996). Profits must be measured as a percent of capital value in order to see how efficiently capital is working. The same goes for forests. Annual growth per acre is much less important than knowing the annual growth value as a percent of the total forest value. One hundred dollars' worth of growth in one year on an acre of timber could be impressive if it was 15 percent of the total forest value per acre. However, if it was only 1 percent, the owner could do better financially by investing the forest capital elsewhere (Klemperer 1996).

The annual percentage value growth rate of a forest is measured by dividing one year's increase in value by the previous year's forest value. For example, if an owner could have cut the timber and sold the land for a total of $1,000 last year, and the timber and land increased in value by $100 over the year, the value growth percent would be 100/1,000 = 0.10, or 10% for last year.

Forest value growth is used to develop the "total return" on timberland assets as a performance measure (Binkley et al. 1996). The components of forest value growth are 1) net income from timber and land

sales during the year, 2) change in timber inventory during the year multiplied by stumpage price at the end of the year, and 3) change in land value during the year. Net income and the change in timber and land value during the year are the numerator in the total return formula (see **Part 4.2.2**). The denominator is the total value of the timberland at the beginning of the year. We use the total return approach in **Part 4.5** to evaluate Idaho endowment forest land performance in the 1999-2001 period.

4.2.1. Total Return Assumptions

The total return concept (see **Part 3.4.2**) includes not only the income produced from the land, but also the appreciation in the market value of the land (Binkley et al. 1996). Two key assumptions underpin the application of this approach to determining the rate of return on timberland assets:

1. The landowner manages timber to capture the annual growth potential of forest lands using a sustained-yield approach to timber management.

2. The landowner knows what the appropriate target or guiding rate of return with which to discount future cash flows is.

The primary forest lands managed by the Idaho Department of Lands are managed as even-aged stands using natural regeneration, and the current age class structure of the forests is skewed to older age classes (Bacon, personal communication). The Department does not manage for the same volume annually, but to provide a sustained yield, which may include fluctuations from year to year (Wiggins, review comments). The Department has been holding some of its forests too long and needs to convert some of the older stands (90-110 years) to younger stands and adopt 50-70 year rotations (Bacon, review comments).

The calculations that follow are based on the sustained-yield even-aged natural regeneration management regime currently practiced by IDL. Intensive even-aged forest plantation management could be expected to increase the annual yield and, in the future, annual timber harvest. Tradeoffs to undertaking such a management strategy include higher capital costs for plantation establishment and other capital-intensive silvicultural activities, and potential diminishment of non-timber values such as scenery and habitat for some wildlife species after switching from natural regeneration to plantation management.

Regarding the second assumption above, we use target or discount rates of 3% to 7% to illustrate how the performance evaluation will be affected by the choice of the guiding or target interest rate (see discussion in **Part 4.3**).

4.2.2. Total Return Performance Evaluation

The total return formula for determining the return on assets for any land asset class is:

$$ROA_t = \frac{(R_t - C_t) + (V_t - V_{t-1})}{V_{t-1}}$$

where:

ROA_t = Return on assets in year t
R_t = Revenues in year t
C_t = Costs in year t
V_t = Value of land asset in year t
V_{t-1} = Value of land asset in the previous year (i.e., $_{t-1}$)

For forest lands, total return includes the net income from timber harvested and the change in the timberland asset value. We will call this the return on assets to timber and land (ROA_{T+L}). It has two components that may be separated analytically: the return on timber revenues (ROA_T), which is a realized gain; and return on land assets (ROA_L), which is an unrealized gain (or loss) in land expectation value (LEV) resulting from changes in the quantity of timber growing stock inventory and stumpage price of the long-term sustained-yield of the projected annual timber harvest. The specific total return formula for Idaho endowment forest lands is:

$$ROA_{T+L(t)} = \frac{(R_{T(t)} - C_{T(t)}) + (LEV_{(t)} - LEV_{(t-1)})}{LEV_{(t-1)}}$$

where:

$ROA_{T+L(t)}$ = Return on timber and land assets in year t
$R_{T(t)}$ = Revenues from timber sales in year t
$C_{T(t)}$ = Costs of timber management in year t
$LEV_{(t)}$ = Land expectation value in year t
$LEV_{(t-1)}$ = Land expectation value in the previous year (i.e., $_{t-1}$)

ROA_{T+L} is a measure of current return, not optimal return. This approach is what institutional investors use, and it is recommended in the forest economics literature (Binkley et al. 1996, Klemperer 1996) and by the Western States Land Commissioners Association (AIS 2000, WSLCA 2001b). The procedure for determining ROA_{T+L} using the total return approach is as follows:

1. Determine the net revenue, or net income, from timber harvests for year (t) by subtracting forest land management costs from revenues received during the year.

2. Determine $LEV_{(t)}$ which is the land expectation value of the timberland asset in year (t). This is done by capitalizing the long-term sustained-yield annual income from timberland using the following formula:

$$LEV = \frac{LTSY \cdot SV}{i}$$

where:

LEV = Land Expectation Value
LTSY = Long-Term Sustained-Yield of annual harvest of timber products
SV = Stumpage Value of the timber products
i = target rate of return, or discount rate of interest, expressed in decimal form

(See discussion of determination of these variables immediately following.)

3. Determine the increase in the value of the asset base from last year to this year by calculating the difference between $LEV_{(t)}$ and $LEV_{(t-1)}$. It is necessary to include this unrealized return because it is directly attributable to the timberland asset. Not including it would be equivalent to saying that the value of the land underlying the timber does not change over time.

What is the long-term sustained-yield (LTSY) of an annual harvest of timber products from endowment lands? That depends on site productivity, the forest management technology employed, and the constraints placed upon management by the need to protect environmental and social values, including water quality, wildlife habitat, scenery, and other aesthetic considerations. The technology and constraints can be expected to change from time to time. The valuation method will accommodate such changes.

It is perhaps desirable for the Idaho Department of Lands to determine an optimal timber management regime, assuming no constraints. The Department can use this information to calculate the opportunity costs of managing for environmental and social values in terms of timber revenues foregone.

What stumpage value (SV) is appropriate? Choices are to use either the current year's timber harvest (paid) price or the timber sale (bid) price. In either case, it is appropriate to weight the stumpage value according to the timber products to be sustained. Another option would be a rolling average of the last five years' stumpage prices (Table 4-2). The timber sale (bid) price is a better estimate of current market value than the timber harvest (paid) price because timber harvests prices paid reflect timber sale bid price contracts that span several years. When bidders win a timber sale, they lock in a stumpage value and can harvest the timber sometime in the future, usually within 5 years. Until the timber is harvested, purchasers pay 6% per year interest on the value of the uncut volume. We use the current year's timber sale bid price average to calculate land expectation value (LEV) in **Part 4.4.4** and analyze the sensitivity of results to stumpage price in **Part 4.5**.

What interest rate (i) or target rate of return should be used? The choice of the interest rate affects:

1. how the performance of land asset managers is judged,
2. how the investor views the future in relation to the present,
3. when a tree, or stand of trees, that are managed with financial guidelines will be harvested, and
4. what the timing and management intensity of inputs will be.

Given the importance of the target rate decision, it would seem desirable to use a range of interest rates from 3% to 7% to develop knowledge about how the choice will influence management decisions and cash flow. The rationale for this range or rates is provided in **Part 3.2.5** and **Part 4.3**. This is a real rate of return, so it is inappropriate to apply an

Table 4-2. Stumpage price trends: timber sale (bid) prices and timber harvest (paid) prices, Idaho Department of Lands annual averages, FY 1989-2001 current values, with 5-year rolling averages.

	Stumpage Values per Thousand Board Feet (MBF)			
	Timber Sale Price (Bid)		Timber Harvest Price (Paid)	
	Annual Average	5-Year Rolling Average	Annual Average	5-Year Rolling Average
1989	$143	m.d.	$90	$69
1990	$163	m.d.	$117	$79
1991	$158	m.d.	$125	$91
1992	$250	$167	$139	$108
1993	$375	$227	$182	$131
1994	$464	$283	$254	$163
1995	$311	$306	$271	$194
1996	$254	$322	$315	$232
1997	$317	$341	$293	$263
1998	$276	$320	$269	$280
1999	$267	$286	$252	$280
2000	$319	$287	$262	$278
2001	$248	$286	$236	$262

Abbreviation: m.d. = missing data (before 1989 data files were for current years).
Source: Idaho Department of Lands (IDL 2000c, 2001c).

inflation rate to stumpage prices. Some may consider it appropriate to compound future stumpage values by a real price increase. The regional forecasts by the U.S. Forest Service project an average stumpage price increase of 1.2% per year for the next 50 years (data from USDA Forest Service 2001). For the selection of timber management regimes, we would discourage the Department of Lands from including stumpage price increases in cash flow projection models.

4.3. Target Rate of Return

Following the discussion in **Part 3.3.2**, we use the terms target rate and discount rate to mean the same thing. Some forest economists recommend determining a real risk-free rate of return, and adjusting it for risk (Klemperer 1996). Because comparisons of different investments need to be made on an equivalent basis, an adjustment for inflation sometimes may be necessary, especially when comparing timberland returns to other assets. The return on common stocks, calculated as the increase (or decrease) in the stock price during the past year divided by the stock's price a year ago, is a *nominal* rate of return, because changes in the relative value of money (or inflation) are included. To compare returns on stocks to returns on timberland, inflation either has to be factored out of the nominal return on stocks, or inflation has to be factored into the *real* value change in timberland. Again, the key is to be consistent. Compare *nominal* rates (with inflation) to nominal rates, and compare *real* rates (without inflation) to real rates. Discussion of appropriate rates for different timberland investor classifications follows.

Private Investors. The potential investor in timberland must choose his or her own discount rate (Vardaman 1989). Although most private investors who are considering investing in timberland do not often announce their discount rate, most of them probably use a real rate of 6% to 8%. Large forest products manufacturing companies seem to use about 6% because they get the added benefit of more secure (i.e., less risky) timber supplies. Some professional land traders seem to use 8% because they have limited capital and must make a big profit whenever they commit it. Everyone else seems to

use about 7% (Vardaman 1989).

For those who already own timberland, selection of the rate of return is equally important (Vardaman 1989). The discount rate first of all enables the investor to determine whether the timberland is performing as desired. The general approach is to appraise the property (i.e., estimate its value). If this value is less than the price at which it can be sold, the investor might be wise to sell it and invest the proceeds elsewhere. The discount rate also has a big effect on whether you cut a tree today or allow it to grow for additional years (Vardaman 1989). In addition, the discount rate has an effect on the intensity and timing of management activities.

Institutional Investors. The California Public Employees Retirement System (CalPERS) manages a pension fund with assets in excess of $150 billion. CalPERS recognizes timberland as having several attractive features, including preservation of investment capital, moderate to low cash flow for operations, value appreciation potential from biological growth and active silvicultural management, and a hedge against inflation. CalPERS uses 6% as a minimum target rate for timberland investments and 6.5% for agricultural land (CalPERS 2000).

State Trust Land Investments. For state trust lands like Idaho, where financial return maximization is a mandated objective, the choice of a discount rate reflects how the trustees and trust land asset managers value future returns and costs in comparison to current ones (Souder and Fairfax 1996). The discount rate simply reflects the trustees' desire for the future return on their investment. A low discount rate means that future effects are valued relatively similarly to current ones, whereas a high discount rate means that events (either returns or costs) are more highly valued today than in the future (Souder and Fairfax 1996).

The choice of a discount rate is particularly crucial in forestry, because investments made today will not mature until decades have passed (Souder and Fairfax 1996). In a 1988 survey of state trust managers, discount rates used for forestry planning ranged from 3.75% (Montana and Oregon) to 7% (Washington). Oregon was unique in establishing different discount rates between the common school beneficiaries and the county forest beneficiaries for evaluating forestry programs on their lands. The discount rate for the common school lands was set at 3.75% and was said to reflect the willingness of the school beneficiaries to make forestry investments with smaller short-term payoffs. On lands where counties are the beneficiaries, the discount rate was set at 4.5%. This reflected the counties' desire for present returns, and meant that potential investments in forest improvements must provide more benefits on their lands in order to be approved. Montana used 3.75% as a discount rate, representing the return on triple-A corporate bonds plus an adjustment for risk associated with future stumpage prices and treatment costs. Arizona used a 5% discount rate. Washington used 7%, a target return that the Department of Natural Resources attempted to earn not only for forestry but on alternative investments as well (Souder and Fairfax 1996).

Target Rate for Idaho Endowment Lands. There is a wide range of choices as to what the guiding or target rate of return for the Idaho Department of Lands might be. The choices of different forest ownership classifications are as follows:

1. Use a discount rate similar to forest industry company lands. According to Vardaman (1989), this would be a real rate of return in the range of 6% to 8%. Factors included in this determination are the cost of capital (borrowed and equity), a risk factor, a deflator to convert nominal interest rates to real rates, and some consideration for income taxes.
2. Use a discount rate similar to institutional investors in timberland (6%, CalPERS 2000).
3. Use a discount rate similar to non-industrial private forest landowners (0% to 14% nominal rate).
4. Use a discount rate similar to the U.S. Forest Service (4% real rate of return, Row et al. 1981).
5. Use a discount rate similar to other state trust land forestry agencies, such as the state of Washington Department of Natural Resources (7%), Montana (3.75%) and Oregon (3.75% or 4.5%) (Souder and Fairfax 1996).

Other state trust land management agencies use a range of target rates from 3.75% to 7%. We therefore suggest using a range of rates, from 3% to 7%, until such time as the Department and the Land Board are comfortable with selecting a single target rate to assess performance and guide decisions.

The U.S. Forest Service has a carefully developed rationale for a discount rate of 4% to evaluate long-term investment projects. Row et al. (1981) used economic arguments and data to support their choice of this target rate. They began by using the opportunity cost of capital in the private sector as the most practical approach for determining society's time preference. This rate is based on returns from triple-A corporate bonds in the 1960s and 1970s. It represents marginal investments of new private capital, and is adjusted for corporate income taxes, general inflation, allowances for risk, and allowances for environmental protection. The resulting 4% real discount rate has been used for more than two decades by the Forest Service to evaluate long-term investments in resource management. According to the Forest Service, 4% approximates long-term measures of the opportunity cost of capital in the private sector of the U.S. economy (Row et al. 1981). Critics of this approach feel it is too low to reflect the private opportunity costs of capital because corporate bonds are only part of the capital costs for industrial firms.

4.3.1. Idaho Land Classes

Idaho's endowment forest lands are classified into three categories: primary forest lands, secondary forest lands, and nonforest lands (IDL 2001a). These classes are defined as follows.

Primary Forest Lands. Forest lands that receive the primary timber management activities of the Idaho Department of Lands are called primary forest lands (Citizens' Committee 2001). These lands typically have well-developed transportation systems, are near milling facilities, and respond to silvicultural treatments (precommercial thinning, fertilizations, plantings, etc.) with sufficient timber volume increases to ensure positive final economic return on the investment (IDL 2001a). These lands are further subdivided into high, medium, and low productivity sites classes (Table 4-3).

"Primary" is a potentially confusing term. The Society of American Foresters defines "primary" forest synonymously with old-growth or virgin forest (Helms 1998). Idaho's endowment forest lands are managed with the primary objective of timber

Table 4-3. Primary forest lands, Idaho Department of Lands, acres and maximum mean annual increment (MAI) by site class, by supervisory area, 2001.

	Acres by Site Class			Maximum MAI by Site Class*		
Supervisory Area	High	Medium	Low	High	Medium	Low
Priest Lake	15,119	42,471	46,196	398	244	128
Pend Oreille Lake	27,566	32,503	29,857	373	208	110
St. Joe	23,567	69,625	36,596	442	266	135
Deary	29,696	19,723	16,449	390	349	124
Orofino	43,070	33,942	31,909	390	349	124
Kamiah	14,431	23,513	16,037	390	349	124
Craigmont	7,289	10,495	1,758	256	197	118
Payette Lakes	5,128	47,706	35,345	256	197	118
Southwestern	2,256	31,836	24,884	256	197	118
Eastern	0	0	39,145	0	0	110
Total acres#	168,112	311,814	278,176	384	257	121

* Maximum mean annual increment (MAI) is the annual average growth per acre (inboard feet) for the particular 5-year age class in which MAI culminates. For example, in the Clearwater region maximum MAI on high sites is at age 84, medium sites at age 99, and low sites at age 119 (data from IDL staff).

Total acres sums to 758,112; maximum MAI in the total acres row is an average of all supervisory areas weighted by acres.

Source: Idaho Department of Lands (IDL 2001a).

production for sale in order to benefit Idaho public schools. This is closer to the definition of "timberland" used by the SAF and the U.S. Forest Service, as land declared suitable for producing timber crops and not withdrawn from timber production by statute or administrative regulation (Helms 1998).

Secondary Forest Lands. Forest lands which do not meet criteria as primary forest lands, and are not nonforest lands, are called secondary forest lands. These lands will receive attention to the extent practicable, given the resources available to the Department of Lands (IDL 2001a).

Nonforest Lands. Nonforest lands are those lands that have never supported forest growth or have been permanently developed for other uses (e.g., agriculture, utility rights-of-way, state highways, or industrial purposes) (IDL 2001a). The Department leases 1.8 million acres of endowment land for grazing, but does not have a land classification for rangeland, in part because some forest land is leased for grazing. A Land Board policy adopted in March 2001 is likely to change this by requiring designation of grazing land where that is the primary use of the land (**Appendix D**).

4.3.2. Idaho Biological Growth Rates

As explained in **Part 4.1.1**, the annual growth rate of trees can be expressed as a percentage of new growth added to the volume of a tree trunk each year. The growth rate is rapid when trees are young, and slows down as trees age.

Using periodic inventory data collected in the field, the Idaho Department of Lands has developed growth and yield tables for various age classes of trees on high, medium, and low productivity sites in each of the agency's operating regions. These data may be used to develop growth rates by age, productivity, and area, that can be used as a first approximation to guide timber harvesting decisions. We use the Clearwater region to illustrate. It includes the Deary, Orofino, and Kamiah Supervisory Areas (Table 4-3). The Clearwater region has 228,779 acres of primary forest land, or approximately one-third of the total primary forest land base. These timberlands are roughly equally distributed in the high (87,197 ac.), medium (77,187 ac.), and low (64,395 ac.) site productivity classes (Table 4-3). Based on growth and yield tables, the volume of standing timber that could be expected at various stand ages (in 5-year age class intervals) is depicted in Figure 4-5 as the broken lines, producing three upward-sloping curves, one for each of the productivity classes, scaled on the right vertical axis. The growth rate is the compound annual rate of increase in volume from the mid-point of one age class to the next. For example, on high sites, at age 69 there are 25,000 board feet (bf) per acre; at age 74 there are 27,900 bf. The compound interest formula is $V_n = V_0 (1 + i)^n$ where V_n = Value in n years from the present time, and V_0 = Value in year zero, at interest rate i. Solving the formula for i, the average annual growth rate is 2.2% for high productivity sites in the Clearwater region between the ages of 69 and 74. These data are plotted at age class mid-points and appear as the 3 heavy lines, scaled to the left vertical axis (Figure 4-5). The broken line in Figure 4-5 is similar to a portion of the general illustration of tree growth used earlier (Figure 4-2).

Only the high site productivity class is used to illustrate how this information provides a proximate guide to the decision when to cut trees. First of all, due to a lack of data we make a simplifying value assumption that the board foot volume of a tree has a constant value; i.e., the board foot volume of a larger, older tree is the same as a smaller, younger tree. This is not a realistic assumption because, as discussed earlier (**Part 4.1.1**), up to roughly 20 inches in diameter, larger sawtimber trees are worth more per unit volume than smaller sawtimber trees. The following analysis could be easily modified by applying appropriate values to the physical volume of timber for the respective age classes. We do not have such information, so a simplifying assumption is necessary. However, we would strongly encourage IDL managers to factor in value differences if they use this analysis as a decision guide. Otherwise they may be cutting trees before they have reached the point of financial maturity, which is where the value growth rate is equal to the guiding interest rate (Klemperer 1996).

If IDL were to follow a policy decision that trees would be cut when forest value growth drops below a target rate of 4%, trees would be cut at age 57, which would yield roughly 18,000 bf/acre (Figure 4-6). This information is determined by locating 4% on the left vertical axis, finding the point at which 4% intersects with the growth rate curves (solid line), reading the cutting age from the horizontal axis, and extending a perpendicular dashed line to the volume curves and reading the volume yield from the right vertical axis (Figure 4-6). Although not graphically illustrated, the same approach can be used for the medium and low site

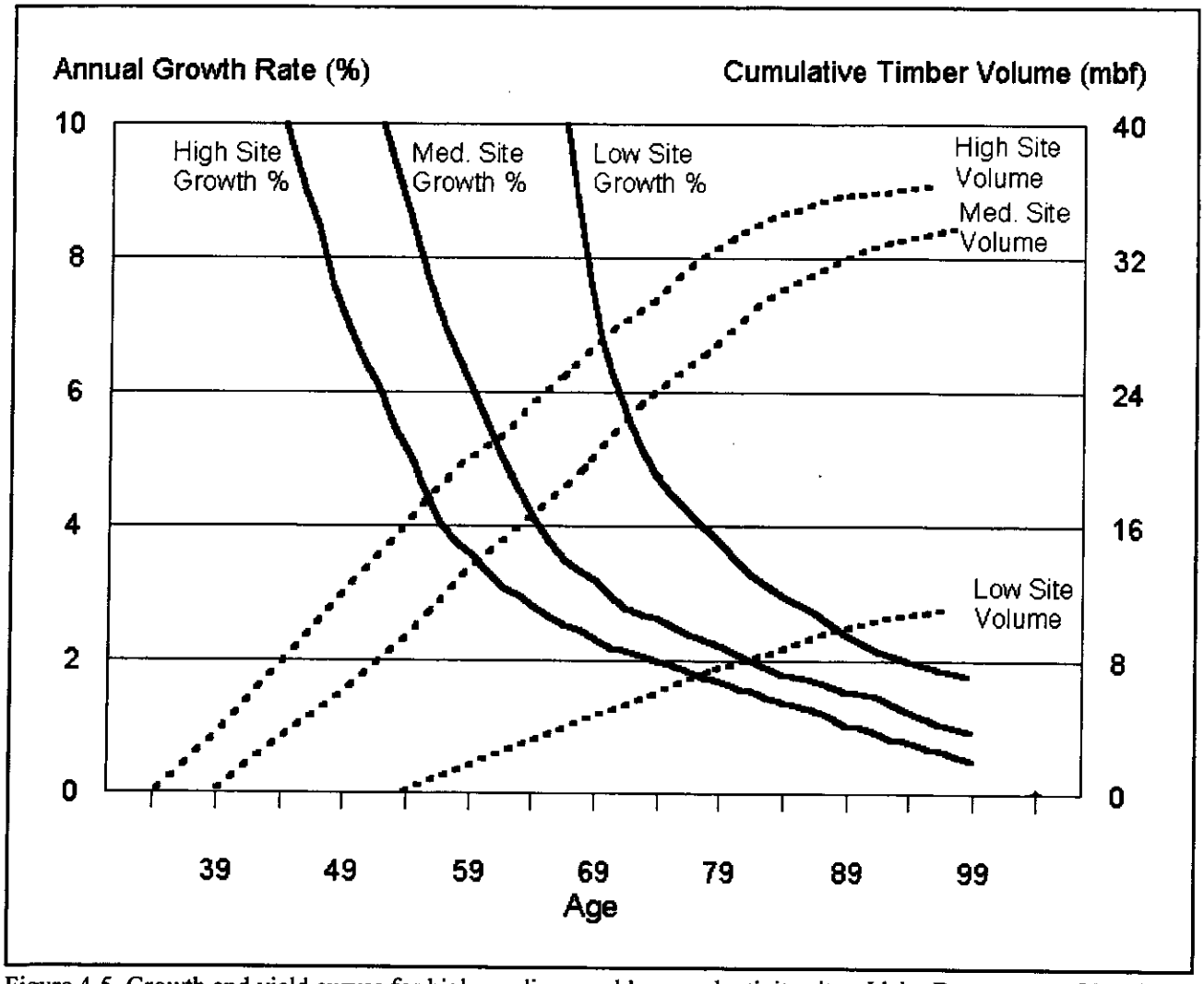

Figure 4-5. Growth and yield curves for high, medium, and low productivity sites, Idaho Department of Lands Clearwater region: yield in cumulative board foot volume by age class (broken lines, right axis); growth rate of timber volume in compound percent per year (solid lines, left axis).
Source: developed from data provided by Idaho Department of Lands staff.

classes in the Clearwater region. Results would be on medium sites, cut at age 65, yielding roughly 17,000 bf/acre. On low sites, cut at age 78, yielding roughly 7,000 bf/acre. The Department has growth and yield tables that can be used to make cumulative growth and growth rate graphs similar to Figure 4-5 from which management guidelines can be developed as in Figure 4-6. What is lacking is the value change from age class to age class.

The 4% target rate used in the illustration was selected because the U.S. Forest Service uses a 4% target rate for long-term investment projects (Row et al. 1981). It is likely the Forest Service would make cutting age decisions similar to the method as illustrated herein, with additional consideration of forest value growth changes per age class, were it not for the National Forest Management Act of 1976. This law requires the Forest Service to use the maximum mean annual increment (MAI) as its decision guide for most harvesting decisions. Basically, until trees reach the senescence stage (see Figure 4-2) they are not cut. This biological decision criterion, called biological maturity, results in large trees but does not allow consideration of the time value of money. If the Clearwater region timberlands of IDL are managed by the maximum MAI decision guide, this would mean on high sites, cut at age 84, yielding 32,800 bf/acre; on medium sites, cut at age 99, yielding 34,600 bf/acre; on low sites, cut at age 119, yielding 14,700 bf/acre. These decision guidelines

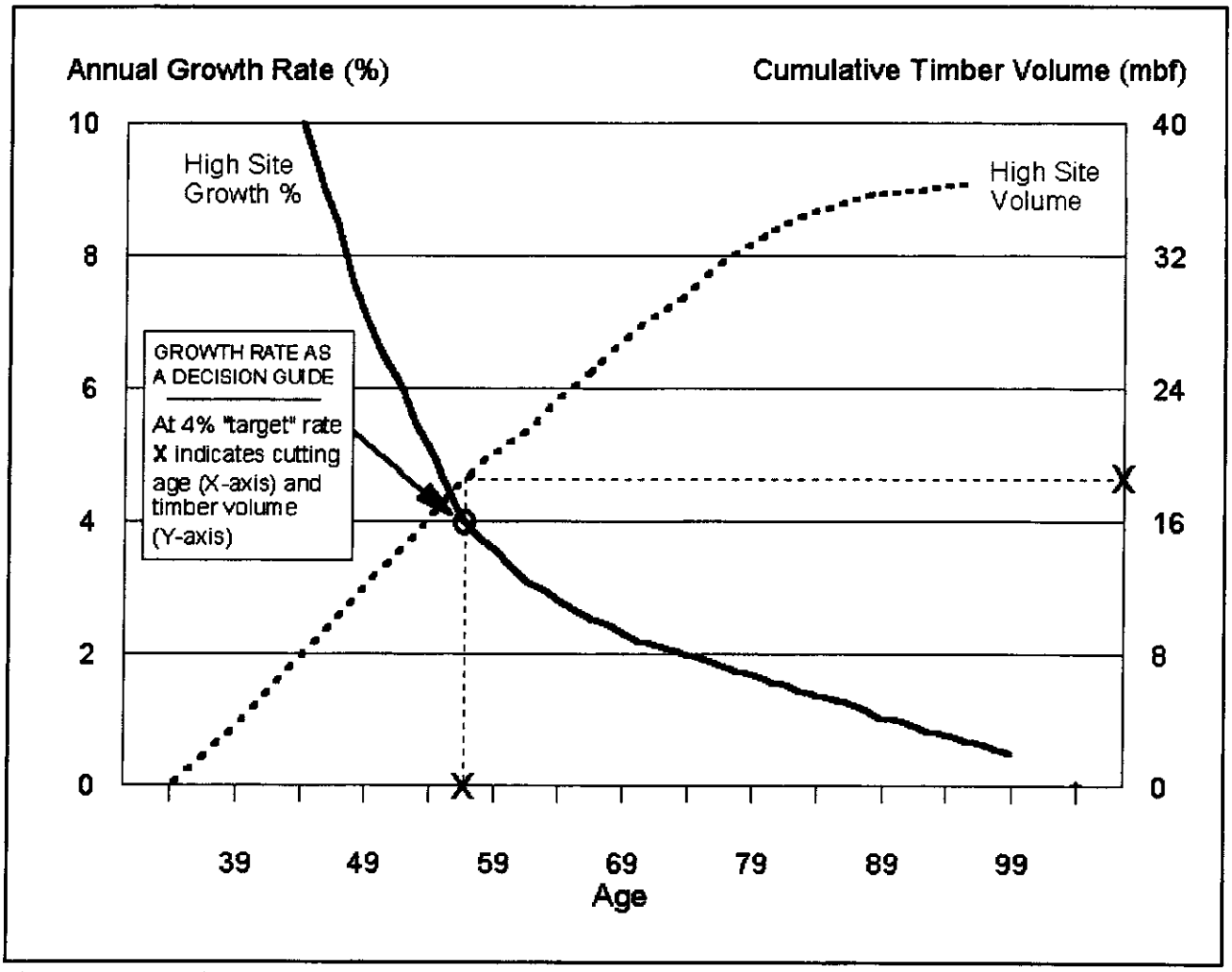

Figure 4-6. Annual growth rate as a timber harvesting decision guide, high-site lands, Idaho Department of Lands Clearwater region.

Note: This decision guide is a first approximation because the dollar value difference by age class is unknown. A more accurate financial decision model would use value growth, not just volume growth.

Source: developed from data in Figure 4-5.

are not determinable from figures presented herein, but illustrations similar to Figure 4-6 could be constructed from existing data.

Is the extra volume produced by postponing the cutting decision from the age of financial maturity (e.g., 57 on high sites) to the age of biological maturity (e.g., 84) worth it? Only if the owner does not consider the time value of money, which is represented by an interest rate. The Forest Service, although mandated to cut at maximum MAI, or biological maturity, nevertheless recognizes that time has a money value, and the agency uses 4% as its target rate for long-term investment analysis and resource management planning purposes (Row et al. 1981).

The Department of Lands generally allows trees to reach at least the age of 80 before cutting them (Bacon and Bruna, review comments). The Department is obviously using the criterion of biological maturity, which has the effect of managing forests as if they were biological (or *physical*) assets rather than capital (or *fiscal*) assets. With the goal of providing "maximum long term financial return" to the beneficiaries of the trust lands it manages, the Department could plan timber harvesting more effectively by shifting from thinking of forests as *physical* assets to *fiscal* assets. The implicit target rate attained from timber growth under current cutting strategies is less than 2%.

4.4. Valuation Approaches

Many managerial decisions are based on estimates of timberland values, and lands are bought and sold in anticipation of an increasing future value (Davis 1966). To obtain a good proxy for market value, institutional investors engage independent appraisers to estimate the bare land value, then add to it the stumpage value of the standing timber inventory and an estimate of the future value of immature timber growing stock (Binkley et al. 1996). This approach is problematic for a very large property, such as Idaho's endowment trust lands.

The problem of determining the value of endowment timberlands is not easy (Hamilton, review comments). Not only is valuation of a growing timber stand a widespread problem (Davis 1966), so is the valuation of forest land (McKetta 1990). How can these values be determined? As in valuation problems of any nature, three general appraisal approaches are possible: [1] current market value based on *comparable sales* of timberlands, [2] *replacement cost*, or [3] *income capitalization* value (Davis 1966). As discussed in **Part 3.4.3**, the *income capitalization* approach using discounted cash flow techniques is the only choice for appraising the value of Idaho endowment timberlands.

This section of the report develops and discusses several valuation methods: a crude estimate of the value of the standing timber inventory (**Part 4.4.1**), an estimate using the *income capitalization* as attempted by IDL appraisers (**Part 4.4.2**), the *income capitalization* formula approach to determine taxable value of timberlands (**Part 4.4.3**), and finally, the land expectation value (LEV), an *income capitalization* approach foresters have been using for 150 years (**Part 4.4.4**). Only the LEV is useful for estimating the value of endowment timberlands for the purpose of evaluating financial performance of forest land assets. Nevertheless some familiarity with other methods is instructive because they are used for valuation purposes other than asset performance evaluation.

4.4.1. Timber Stumpage Inventory Valuation

In 1999 there were 7.3 billion board feet of standing timber inventory on Idaho endowment lands (Table 4-4). Multiplying the timber growing stock inventory by 1999 stumpage prices, the product is $2.3 billion (Table 4-4).

Is $2.3 billion the value of Idaho's endowment forest *lands*? No, this estimate is simply not meaningful (Keegan, review comments). It is a crude estimate of the value of merchantable *timber* on those lands, under the assumption that 7.3 billion board feet of timber could be sold at the same price that the Department received for roughly 200 million board feet it sells annually. The assumption is unrealistic. The current market consumption mill capacity is 1.3 billion board feet per year in Idaho. With 7 billion board feet on the market, mills would be overwhelmed with supply and the stumpage price would plummet.

In the past IDL staff has assumed for valuation purposes that one or two large buyers would acquire the entire timberland holding, and then staff applied a "deep discount" of 40% to 60% to the standing timber inventory value as determined in Table 4-4 (Hamilton, review comments; IDL 2000a). This would result in a 1999 valuation of somewhere in the neighborhood of $900 million to $1.4 billion. When there are other methods available, there is little justification for using this approach to determine the value of the timberland asset for financial performance measures such as return on asset value.

4.4.2. Income Capitalization—Asset Valuation Report

The *comparable sales* approach to appraising the value of Idaho endowment forest lands is very difficult. When the sales and the subject property are very dissimilar, which oftentimes is the case, the reliability of the *comparable sales* is limited (IDL 2000a).

In this situation, the *income capitalization* approach must be used. This method is based on the principle of anticipation (IDL 2000a):

> Because value is created by the expectation of benefits to be derived in the future, value may be defined as the present worth of all rights to these future benefits. All income capitalization methods, techniques, and procedures attempt to consider anticipated future benefits and estimate their present value (Appraisal Institute 1992).

There are several approaches available to appraise the value of Idaho endowment forest lands using the *income capitalization* method. One method is to average IDL net income received in the past 10 years and capitalize it at several discount

Table 4-4. Merchantable forest products inventory on primary forest lands, Idaho Department of Lands, and estimated liquidation value, 1999.

Administrative Area	Timber Inventory Growing Stock Volume by Species (million board feet)							
	WP	PP	DF/L	GF/HEM/ SAF	WRC	ES	LP	Total
Priest Lake	49.5	18.4	189.7	379.7	128.5	51.7	69.3	886.8
Pend Oreille	24.7	60.4	290.5	171.6	105.2	3.5	30.4	686.3
St. Joe	54.7	28.4	596.8	707.3	170.4	15.3	178.2	1,751.1
Clearwater	61.3	216.8	822.0	1,1197.2	265.7	25.7	31.4	2.620.1
Payette Lakes	0.0	115.4	261.2	250.6	0.0	102.5	42.1	771.8
Southwest	0.0	149.1	146.9	49.0	0.0	0.0	6.8	351.8
Eastern Idaho	0.0	0.0	156.6	23.5	0.0	1.2	66.0	247.3
Total Volume	190.2	588.5	2,463.7	2,778.9	669.8	199.9	424.2	7,315.2
Stumpage Value ($ per mbf, 1999)	$450	$335	$300	$310	$450	$245	$250	$320
Volume x Value ($ million)	$86	$197	$739	$861	$301	$49	$106	$2,340
Liquidation Value* ($ million)	$34	$79	$296	$344	$120	$20	$42	$936

Abbreviations: mbf = thousand board feet (Scribner scale); WP = White Pine, PP = Ponderosa Pine, DF/L = Douglas-Fir/Larch, GF/HEM/SAF = Grand Fir/Hemlock/Sub-Alpine Fir, WRC = Western Red Cedar, ES = Englemann Spruce, LP = Lodgepole Pine.

* IDL appraisers suggest the need to apply a "discount" of 40 % to 60% to the inventory volume times stumpage value extension to estimate a liquidation value that would occur by selling forest lands to one or two large buyers (IDL 2000a; Hamilton, review comments); a 60% "discount" is applied here.

Source: developed from "2000 Asset Valuation Report" (IDL 2000a).

rates, as IDL (2000) staff did. This produces values for all endowment lands ranging from $537 million at a 10% discount rate, to $894 million at 6%, $1.1 billion at 5%, and $1.3 billion at 4% (IDL 2000a).

For comparison, we calculate the land expectation value for primary forest land to be $709 million for the period 1999-2001 at a 6% discount rate, or $1.063 billion at 4% (see Table 4-6 in **Part 4.4.5**). The endowment lands include more than 500 lakeshore cottage sites that provided in 2000 net income of $3,043,300, which at 4% has a capitalized value of $76 million; mineral leases provided net income of $937,600 that at 4% has a capitalized value of $23 million (IDL 2001b). Rangelands provided $320,000 in net income, at 4% a capitalized value of $8 million. However, the grazing fee is administratively set at less than fair market value, and an adjustment to a fair market value grazing fee would result in a capitalized value of forage from rangelands at 4% to be more like $26 million (see Table 5-1 in **Part 5.3.3**). These asset classes total at a 4% capitalization rate to $1.188 billion, without including any value for 236, 000 acres of secondary forest lands. The total is close to the IDL estimate in the "2000 Asset Valuation Report" (IDL 2000a).

4.4.3. Taxable Value of Forest Lands

Idaho, like most states, uses a formula to compute the value of private lands for property taxation purposes that has little to do with the actual market value of land (Klemperer 1983, Amacher et al. 1991). The use of the productivity valuation formula in Idaho is the subject of PAG Report #20 (Cook and O'Laughlin 2001). The state of Montana requires by statute that for the purpose of evaluating the performance of Montana's endowment forest land assets, the forest productivity taxation formula

be used to establish the value of these assets.

Idaho and Montana use the same productivity valuation formula for taxation purposes. It is an *income capitalization* approach to valuation based on the following assumptions:

1. Land productivity is the annual growth increment of timber at age 80 in a particular site quality class (e.g., high, medium, or low).
2. The land is valued as if an 80-year old stand of trees were ever-present as part of the timber production "factory" providing the annual growth increment.
3. A landowner's implied guiding interest rate or target rate of return is the cost of capital for loans from the Farm Credit Services bank district serving the Spokane area.

The remainder of this section explains how the Montana Department of Natural Resources and Conservation (DNRC) uses the productivity taxation formula to evaluate its performance as measured by return on asset value. The result is a total return on asset value from the timber and the land portions of the asset. The returns from timber are the net income from timber sales realized in a given year. The returns from land are an unrealized change in the underlying asset value attributable to changes in stumpage value. So far, so good.

In 1999, Montana passed a law requiring the Board of Land Commissioners to provide annual reports regarding the average revenue to trust beneficiaries of forested lands as a rate of return on asset value (Montana DNRC 2000). The Montana DNRC manages 424,329 acres of productive forest lands as a trust. The "asset value" of these lands was determined to be $259 million in 2000, using the Department of Revenue land value estimate (Montana DNRC 2000). This is the same formula used by the Idaho State Tax Commission to determine for taxation purposes the productivity value of forested lands (see Cook and O'Laughlin 2001). Now the performance evaluation becomes problematic.

Determining the return on assets relies on the definition in *Forest Resource Economics and Finance* (Klemperer 1996), which is simply the net income per year divided by the asset value. As the Montana DNRC (2000) says, "The value of the asset is often a sticky point." The asset value should reflect the current market value of the asset (Klemperer 1996). The productivity value taxation formula does not provide a proxy for current market value.

The Montana statute requires calculation of the asset value based on Department of Revenue forest tax procedures. Previously two other measures of asset value were used. One was the present value of current sustainable yield harvests determined for 151 years of harvests multiplied by the stumpage value (at 0% and 1% annual increases), then discounted to the present using a range of discount rates from 2% to 10%. The second approach formerly used was an appraised market value of the land, about which the Montana DNRC (2000) says, "the appraised market value of land would yield mixed results. The appraised value for timberland is lower than the [productivity value] results here indicate, while land that has potential for rural recreation or is near a city such as Missoula or Kalispell may have higher market value than the results here indicate." However, according to forest economics literature, the productivity valuation formula is not a good method for appraising fair market value (Klemperer 1983, Amacher et al. 1991).

Productivity Formula for Taxation Purposes. Montana law requires the DNRC to use the asset value based on the productivity value of forest land for taxation purposes (V). The formula, on a per acre basis, is the same as Idaho's:

$$V = ((M \times SV) + AI - C) / R$$

where:

M = mean annual net wood production
SV = stumpage value
AI = agricultural-related income
C = cost of management
R = capitalization rate

Explanation of the variables follows. Annual net wood production (M) is a function of land productivity. Montana uses four productivity classes. Idaho uses the same formula and has three productivity classes varying across different regions. The stumpage value (SV) used in Montana is in constant (i.e., inflation-adjusted) dollars. In Idaho it is a rolling average of the previous 5 years of nominal stumpage prices, unadjusted for inflation.

The Montana capitalization rate (R) is based on the same rate as Idaho, and is also modified administratively as is Idaho's. The base rate is the nominal interest rate from the Farm Credit Bank in Spokane, which changes each year. In 1990 it was 11.59%; in

1999 it was 8.31%. Since 1990 in Idaho, the combined effect of stumpage value increases and discount rate (R) decreases has caused the productivity value to increase substantially (Cook and O'Laughlin 2001). The Montana situation is likely to be similar.

Montana Return on Assets with Productivity Valuation. In Montana for the year 2000, "The average net return on asset from forested trust lands is 5.7%, which includes land appreciation" (Montana DNRC 2000). In 2000, the Montana DNRC earned net revenue of $2.7 million from its state trust forests, or a 1.0% return on the 1999 asset value of $259.6 million; land appreciation averaged $12.3 million per year from 1990 to 1999, or roughly a 4.7% return on the asset value (Montana DNRC 2000). The productivity formula thus results in an average estimated value of $610 per acre for the 424,329 acres of Montana endowment forest lands.

It is important to include land value appreciation in the return on asset calculation (Klemperer 1996, WSLCA 2001b). However, land value appreciation should reflect the market value (Binkley et al. 1996). The productivity valuation formula is not a good proxy for land market value (Klemperer 1983, Amacher et al. 1991).

Idaho Return on Assets with Productivity Valuation. Although the current productivity formula is not a good estimate of the fair market value of timberland, such analysis would provide some benchmark for performance evaluation by comparing Idaho results to Montana.

Following the same approach as Montana, performance results based on the productivity taxation formula in Idaho are as follows. In the year 2000, the average net return on assets from forested trust lands is 2.0%, which includes negative land value change. In 2000, the Idaho Department of Lands earned net revenue of $62.6 million from its state trust forests, or a 7.5% return on the 1999 asset value of $836 million; land value change from 1999 to 2000 was –$46 million, or roughly a –5.5% return on the 1999 asset value. The productivity formula thus resulted in an average estimated value of $843 per acre in 1999 for the 994,189 acres of all Idaho endowment forest lands, and $797 per acre in 2000.

Comparing these results to Montana, Idaho trust land managers in 2000 attained a 7.5% return on assets from timber sales; their counterparts in Montana attained 1.0%. Regarding the land value changes in different directions, the stumpage values used in the Montana formula went up from 1999 to 2000, while those in the Idaho formula went down.

As demonstrated in the next section, the fair market value of Idaho endowment forest lands for growing timber is very likely higher than the $790 million that the productivity formula indicates for the year 2000. Undervaluing the forest land asset base results in overestimating the return on asset value. One reason why the productivity formula undervalues forest lands is the use of a *nominal* discount rate of approximately 10.15% to discount *real* stumpage values projected into the future (McKetta, review comments). The discount rate needs to be deflated. The GNP deflator can be used to do this. Over the past 50 years, it has increased at an average annual rate of 3.6%; for the past 20 years the rate of increase averaged 3.2% per year. Adjusting the nominal discount rate of 10.15% for inflation would put it in the range of 6.6% to 7.0%. At a real 7% discount rate, the productivity formula results in a 2000 asset value of $1.15 billion for Idaho endowment forests, or $1,155 per acre. At a lower 4% discount rate, the formula results in a value of $2.0 billion, or $2,021 per acre. In the next section, land expectation values (LEVs) at a 4% discount rate are $1.02 billion in 1999, $1.24 billion in 2000, and $932 million in 2001 (see Table 4-5 in **Part 4.4.4**).

4.4.4. Land Expectation Value

The forest valuation problem was solved long ago by German forester Martin Faustmann (1849) with a discounted cash flow formula called the land expectation value (LEV). At a specified interest rate the value of land for growing timber under any specified management regime can be calculated with the Faustmann formula. Although the calculation is not complex, it is not commonly used by appraisers. This approach is so widely recognized as the standard forest valuation criterion among forest economists that appraisers may benefit from including it in their menu of valuation techniques (Straka and Bullard 1996).

The Faustmann formula reflects the willingness of a buyer to purchase bare land upon which to grow timber (Klemperer 1996). The calculated result of the Faustmann formula is generally called the land expectation value (LEV). Land value does not enter into the calculation; land value is what you are calculating (McKetta 1990).

The formula for LEV was presented in **Part**

3.2.2, where it is obvious that LEV is a variation of net present value (NPV) for a series of identical future cash flows discounted to the present with a specified interest rate. Unlike the NPV, the LEV assumes that the cash flows do not terminate, but continue in a perpetual cycle.

The LEV can be used when an income stream is assumed to be perpetual, whether the income cycle is annual or less frequent (Bullard and Straka 1998). The LEV formula uses constant dollars and a real interest rate, and requires judgments about forest yield, stumpage prices, and management costs, including reforestation following timber harvest.

Land and timber are the two basic assets comprising a forest. In estimating the monetary or financial value of forests, there is a need to distinguish between the *timber* assets and the timber*land* assets (Bullard and Straka 1998, emphasis in original). In estimating the value of land, and in estimating the value of timber for future harvest, foresters estimate present values using discounted cash flow techniques to account for the time value of money depending on how land is managed. There are two basic situations, described below: even-aged and uneven-aged management.

Even-Aged Valuation Approach. The classical application of the Faustmann formula for determining forest value is to analyze each timber stand individually from the time trees are established on bare land until the time the mature timber is clearcut harvested. In this case the formula provides the value of only the bare land for growing timber. For appraisal of land with standing timber, the value of mature and immature timber must be added to the bare land value, using a current liquidation value. Mature timber is appraised at its fair market value. Immature timber is appraised by discounting its estimated future value to the present.

This approach to valuation is useful for determining the optimal even-aged management regime for an individual timber stand at a specified guiding interest rate or target rate of return. Because of the substantial acreage of Idaho endowment timberlands, the information needs and calculation tasks for analyzing and compiling bare land values for each stand are daunting. There is also the problem of determining a realistic liquidation value for 7.3 billion board feet of mature timber, which is well in excess of regional processing capacity. Some defensible rationale for "deep discounting" (see **Part 4.1.1**) would also be necessary.

Nevertheless the value of the endowment timberland asset could be appraised by aggregating the value of all the stands. However, for the purposes of performance evaluation there is an easier approach, explained in the next two subsections.

Uneven-Aged Valuation Approach. Uneven-aged timber stands contain trees of various ages. Usually mature trees are selectively harvested on a cycle of some sort. The tract may be harvested annually, removing some amount of the timber growing stock inventory volume each year; or, perhaps, timber volume is removed less frequently, say, every 5 or 10 years. In this situation, the value of the land and timber must be estimated concurrently and one cannot be separated from the other. Unless all the trees are cut, bare land never exists under uneven-aged management, so land and timber together are a perpetual timber-producing "factory" (Straka and Bullard 1996). In the forest valuation process, therefore, land and timber values are estimated jointly rather than separately (Bullard and Straka 1998).

As described in **Part 3.2.2**, when land management produces a perpetual annual income stream, the LEV formula reduces to:

$$LEV = \frac{A}{i}$$

where:

LEV = Land expectation value
A = Net income generated annually
i = Interest rate, expressed in decimal form.

When net timber revenue occurs on a periodic basis—say, every 10 years—the standard LEV formula is used. Such a forest is said to have "cutting cycles," where a "reserve growing stock" is permanently maintained, and growth from this constant reserve is cut periodically. This is analogous to maintaining the principal in a savings account and periodically withdrawing interest (see Bullard and Straka 1998). The calculations for Idaho endowment lands are simpler because the cutting cycle is every year, allowing the use of the above formula.

Endowment Lands Valuation Approach: Even-Aged Stand Management and an Uneven-Aged Forest. The Idaho Department of Lands manages the 758,000 acres of endowment primary forest land, or timberlands, primarily as even-aged stands and uses natural regeneration methods, although

seedlings are hand-planted on a few hundred acres of land each year (Bruna and Bacon, personal communication). When the aggregate of all stands is considered as a single forest management unit, the forest is uneven-aged because it consists of stands of different ages. So although the endowment forest land stand management strategy is even-aged, the result in aggregate is an uneven-aged forest (Wiggins, review comments).

The Department's management strategy is sustained yield, producing approximately the same amount of timber annually from the endowment lands each year (Wiggins, review comments). The sustained-yield management strategy of the Department, together with the uneven-aged aggregation of stands that comprise the forest, allows the use of an uneven-aged approach to calculating the value of the entire endowment forest land holding as a single forest property.

The Department currently offers approximately 180 million board feet of timber and 20,000 cedar poles for sale annually (Wiggins, review comments). This has fallen from approximately 200 million board feet of timber and the same quantity of cedar poles in the early 1990s. The Department recently said, "Harvest levels could increase somewhat but will probably stay below the levels of the early 1990s" (IDL 2000a). The Land Board sets the harvest levels for the endowment lands based on technical advice and inventory data and analysis provided by the Department (Wiggins, review comments).

For simplification purposes, we analyze the entire endowment forest property as one forest management unit that produces essentially the same long-term sustained-yield of timber year after year, in perpetuity. An annual income makes the *income capitalization* appraisal method easier because the formula is simpler. In addition, this simplifying assumption results in an appraisal of timberlands where the values of timber and land are estimated simultaneously. This can be done because a reserve growing stock is permanently maintained and growth from the constant reserve inventory is harvested periodically (Bullard and Straka 1998).

4.5. Total Return on Assets (ROA) Estimate

The LEV is used in this section to estimate the asset value of Idaho endowment forest lands, and to measure the performance of the asset based on net income received during the 3-year period 1999-2001. Data necessary to determine these measures are as follows.

The Idaho Department of Lands produced net income from forest lands ranging from $66 million in 1999 to $52 million in 2001. The Department sold approximately 180 million board feet of sawtimber in each of the previous four or five years. Net revenues were derived from the harvest of between 266 million board feet of timber in 1999, 239 million in 2000, and 221 million in 2001. There are several reasons why more timber is harvested than was sold. Timber sale contracts cover a multi-year period, with the timing of the harvest at the purchaser's discretion. Purchasers pay 6% per year interest on unharvested contracts that are included as timber sale revenues. There are also additional products such as pulpwood not included in the original sale for which the Department receives revenue.

The endowment lands timber growing stock inventory in 1999 was 7.3 billion board feet (Table 4-4). The inventory growth rate is approximately 2.6% per year (Table 4-1). The growth rate is net of mortality, thus an estimate of the annual growth increment is 190 million board feet per year. This estimate was developed from U.S. Forest Service inventory data collected in 1991. It is approximately the same as the Department's long-term sustained-yield annual timber harvest goal, which during the 1990s was 186 million board feet. The price for timber sale bids was $319 per mbf in 2000, a 19.5% increase from $267 per mbf in 1999; in 2001 it was $248 (Table 4-2).

Using the above data in the return on assets formula (**Part 4.2.2**) and a 4% target rate to determine the LEV, the total return on timberland assets (ROA_{T+L}) was 0.6% in 1999, 28.0% in 2000, and -20.6% in 2001 (Table 4-5). The base asset value is the land expectation value calculated for the previous year (LEV_{t-1}). At a 4% target rate, net income from timber revenues provided a return on assets (ROA_T) of 6.2% in 1999 and 2000, and 4.2% in 2001. The change in LEV provided an unrealized 21.8% return on assets (ROA_L) in 2000, due mostly to the stumpage price change from 1999 to 2000. The ROA_L was –5.6% in 1999 and –24.8% in 2001. When stumpage prices decrease from one year to the next, as from 1998 to 1999 and 2000 to 2001, the decrease in LEV will generate an unrealized loss in asset value, as occurred in 1999 and 2001 (Table 4-5).

Table 4-5. Total return on assets: timber and land (ROA_{T+L}), using a 4% discount rate to calculate land expectation value (LEV), Idaho endowment forest lands, FY 1999-2001.

	Fiscal Year$_t$		
	FY 1999	**FY 2000**	**FY 2001**
Net Income Calculation			
(a) Cash income from forest land management[1]	$75,387,100	$72,407,500	$61,077,400
(b) Cash expenditures for forest land management[1]	$8,960,800	$9,743,200	$8,852,000
(c) Net income from forest land[1]	$66,426,300	$62,664,300	$52,225,400
Land Expectation Value (LEV) Calculation (@ 4%)			
(d) Timber stumpage sale (bid) price[2]	$267 / mbf	$319 / mbf	$248 / mbf
(e) Long-term sustained-yield (LTSY) timber harvest[3]	186 mmbf	186 mmbf	186 mmbf
(f) Expected value of annual LTSY timber harvest[4]	$49,662,000	$59,334,000	$46,128,000
(g) Cash expenditures for forest land management[1]	$8,960,800	$9,743,200	$8,852,000
(h) Expected annual net income from timber[5]	$40,701,200	$49,590,800	$37,276,000
(i) Land expectation value (LEV) @ 4%[6]	$1,017,530,000	$1,239,770,000	$931,900,000
(j) LEV change from previous year (i.e., $_{t-1}$ to $_t$)[7]	($60,032,500)	$222,240,000	($307,870,000)
Total Return on Assets: Timber and Land (ROA_{T+L})			
(k) Return on assets: timber income (ROA_T)[8]	6.2%	6.2%	4.2%
(l) Return on assets: land value change (ROA_L)[9]	-5.6%	21.8%	-24.8%
(m) Total return on assets: timber & land (ROA_{T+L})[10]	0.6%	28.0%	-20.6%

Abbreviations: mbf = thousand board feet; mmbf = million board feet (Scribner scale).

Footnotes on source data and calculation methods:

[1] Source: "Total by Asset Type, Statement of Cash Flow, FY 1992 - FY 2000" (IDL 2001b).

[2] Timber sale (bid) price is more appropriate than timber harvest (paid) price because purchasers are given several years to harvest timber (IDL 2001c).

[3] Source: Idaho Department of Lands, personal communications with staff.

[4] (d) x (e)

[5] (e) - (f); the analysis is done in real inflation-adjusted terms, no stumpage value increase is applied.

[6] (h) / .04

[7] $LEV_t - LEV_{t-1}$

[8] $(c)_t / LEV_{t-1}$

[9] $(j)_t / LEV_{t-1}$

[10] (k) + (l)

Sensitivity Analysis: Discount Rate. Forest economists use a process called sensitivity analysis to understand how a change in the value of a single variable will affect a performance measure. In Table 4-6, we tested the sensitivity of the return on assets calculation to the target rate used to discount future cash flows for determining a land expectation value (LEV). At target rates ranging from 3% to 7%, the rate of return from timber income (ROA_T) ranged between 4.6% and 10.8% in both 1999 and 2000, and somewhat less in 2001 (Table 4-6). The "bottom line" is a total return on assets ranging from –21.7% (FY 2001 @ 3%) to 32.6% (FY 2000 @ 7%). For each additional 1% added to the interest rate used to determine land expectation value (LEV), an another 1.5% is added to the timber income portion of return

Table 4-6. Sensitivity analysis: effect of discount rates from 3% to 7% on land expectation value (LEV) and total return on assets (ROA_{T+L}), Idaho endowment forest lands, FY 1999-2001.

	Fiscal Year$_t$		
	FY 1999	**FY 2000**	**FY 2001**
Land Expectation Value (LEV) Calculation			
Expected annual net income from timber*	$40,701,200	$49,590,800	$37,276,000
Land expectation value (LEV) @ 3%	$1,356,706,667	$1,653,026,667	$1,242,533,333
Land expectation value (LEV) @ 4%*	$1,017,530,000	$1,239,770,000	$931,900,000
Land expectation value (LEV) @ 5%	$814,024,000	$991,816,000	$745,520,000
Land expectation value (LEV) @ 6%	$678,353,333	$826,513,333	$621,266,667
Land expectation value (LEV) @ 7%	$581,445,714	$708,440,000	$532,514,286
Total Return on Assets: Timber and Forest Land (ROA_{T+L})			
Expected annual net income from timber*	$66,426,300	$62,664,300	$52,225,400
Return on assets: timber income (ROA_T) @ 3%	4.6%	4.6%	3.2%
Return on assets: timber income (ROA_T) @ 4%*	6.2%	6.2%	4.2%
Return on assets: timber income (ROA_T) @ 5%	7.7%	7.7%	5.3%
Return on assets: timber income (ROA_T) @ 6%	9.2%	9.2%	6.3%
Return on assets: timber income (ROA_T) @ 7%	10.8%	10.8%	7.4%
Land expectation value (LEV) change ($_{t-1}$ to $_t$) @ 3%	($80,043,333)	$296,320,000	($410,493,333)
Land expectation value (LEV) change ($_{t-1}$ to $_t$) @ 4%	($60,032,500)	$222.240,000	($307,870,000)
Land expectation value (LEV) change ($_{t-1}$ to $_t$) @ 5%	($48,026,000)	$177,792,000	($246,296,000)
Land expectation value (LEV) change ($_{t-1}$ to $_t$) @ 6%	($40,021,667)	$148,160,000	($205,246,667)
Land expectation value (LEV) change ($_{t-1}$ to $_t$) @ 7%	($34,304,286)	$126,994,286	($175,925,714)
Return on assets: land value change (ROA_L) @ 3%	-5.6%	21.8%	-24.8%
Return on assets: land value change (ROA_L) @ 4%*	-5.6%	21.8%	-24.8%
Return on assets: land value change (ROA_L) @ 5%	-5.6%	21.8%	-24.8%
Return on assets: land value change (ROA_L) @ 6%	-5.6%	21.8%	-24.8%
Return on assets: land value change (ROA_L) @ 7%	-5.6%	21.8%	-24.8%
Total return on assets: (ROA_{T+L}) @ 3%	-0.9%	26.5%	-21.7%
Total return on assets: (ROA_{T+L}) @ 4%*	0.6%	28.0%	-20.6%
Total return on assets: (ROA_{T+L}) @ 5%	2.1%	29.5%	-19.6%
Total return on assets: (ROA_{T+L}) @ 6%	3.7%	31.1%	-18.5%
Total return on assets: (ROA_{T+L}) @ 7%	5.2%	32.6%	-17.5%

* Indicates data presented or developed in Table 4-5.

on assets (ROA_T). The land value change portion of return on assets (ROA_L) is unaffected by the choice of a target rate (Table 4-6).

It is clear that the higher the target rate of return, the higher the return on assets from timber income will be (Table 4-6). This happens only because the higher target rate results in lower land expectation values. Which target rate is appropriate? The multiple functions of the target rate need to be considered. The higher the target rate, the lower the cutting age will be (see **Part 4.3.2**). We revisit this important concept in **Part 7.2.3**.

Sensitivity Analysis: Stumpage Price. The return on assets (ROA_{T+L}) is also sensitive to stumpage price. Given the significant change that can occur in Idaho stumpage prices from one year to the next (Figure 4-7), it is perhaps desirable to smooth out the fluctuations in stumpage prices in order to dampen gyrations in land expectation value. A simple method used by the Idaho State Tax Commission to calculate the assessed value of forest land for taxation purposes (see **Part 4.4.3**) is a 5-year rolling average of stumpage prices.

During the 1989-2001 period, the average timber sale bid price ranged from a low of $143/mbf in 1989 to a high of $464/mbf in 1994 (Table 4-2, Figure 4-7). During this 13 year period, bid prices went up six times from one year to the next, and also went down six times.

There was also considerable fluctuation in timber harvest stumpage prices, but not as much as in sales prices (Figure 4-7). According to the Department of Lands, the difference in the price trends

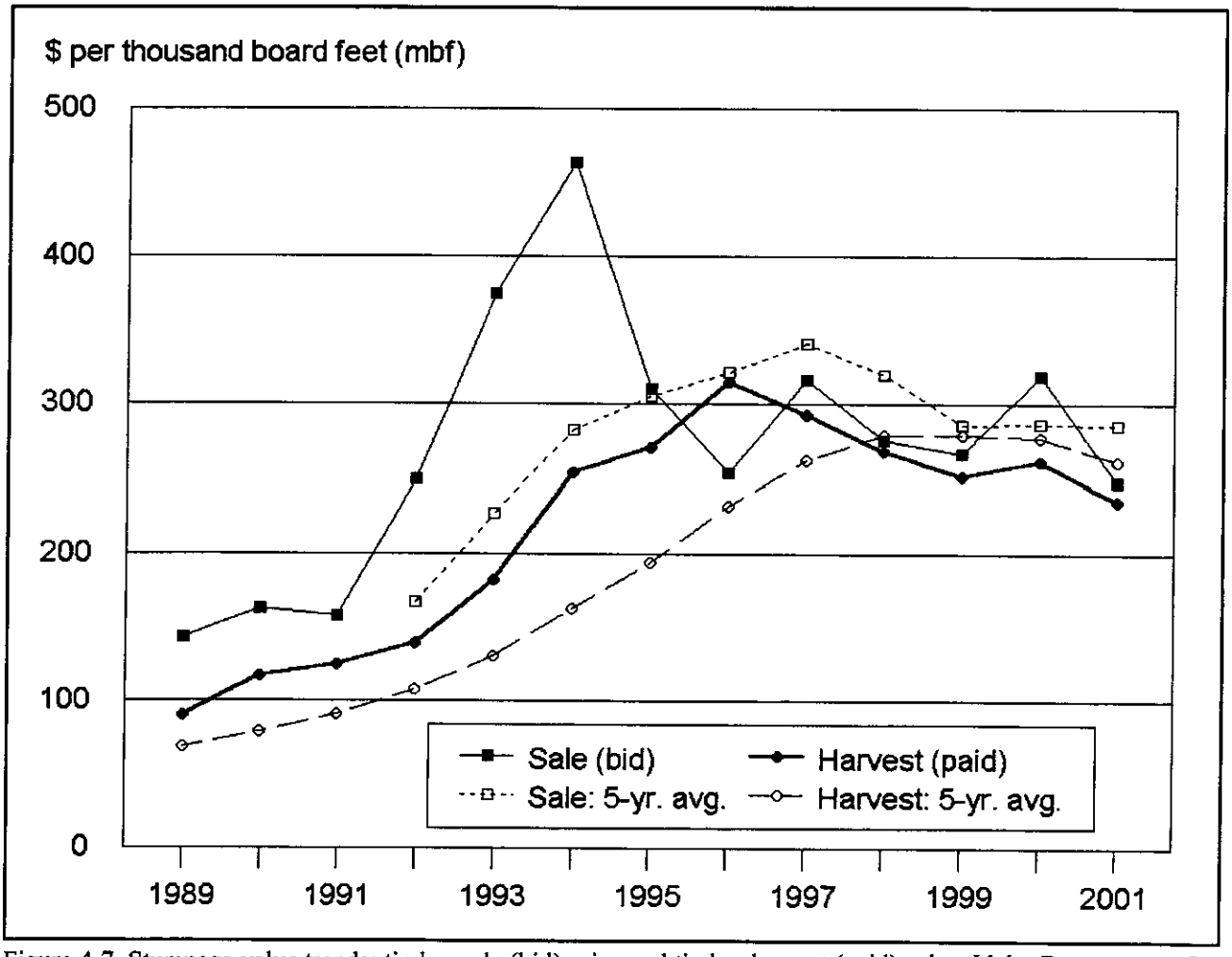

Figure 4-7. Stumpage value trends: timber sale (bid) price and timber harvest (paid) price, Idaho Department of Lands annual averages, FY 1992-2000 current values, with 5-year rolling averages.
Source: developed from data provided by Idaho Department of Lands (see Table 4-2).

between sale (bid) and harvests (paid) can be explained because several large high-value sales from 1994 remain uncut, as purchasers asked for and were granted extensions (Wiggins, personal communication).

Time series data fluctuating as much as Idaho timber sale bid prices suggest a need to analytically "smooth" the peaks and valleys toward a trend. The 5-year rolling average for stumpage sale bid prices peaked in 1997 at $341, dropped to $320 in 1998, and has dropped and steadied at $286 since then. Rolling averages for timber harvest prices have behaved somewhat differently, continually rising to a peak of $280 in 1998 and 1999, tapering off two dollars in 2000, and falling to $262 in 2001 (Table 4-2, Figure 4-7).

The effect of smoothing with 5-year rolling averages of stumpage bid prices considerably reduces the variability of total return on assets. Without smoothing, ROA_{T+L} (with a 4% discount rate for the LEV) ranged from –20.6% in 2001 to 28.0% in 2000; with smoothing, the range was –7.9% in 1999 to 3.7% in 2001 (Table 4-7).

The return on assets from timber income is affected by smoothing, but not as much as the return on assets from land value change (Table 4-7). The downside of smoothing with the rolling average technique is a time lag. Performance measures using smoothed data reduce the peaks and valleys, but it becomes more difficult to identify potential cause and effect relationships between performance measures and actual prices, revenues, and costs.

Table 4-7. Sensitivity analysis: effect of smoothing timber stumpage sale (bid) prices on land expectation value (LEV at 4% discount rate) and total return on assets (ROA_{T+L}), Idaho endowment forest lands, FY 1999-2001.

	Fiscal Year$_t$		
	FY 1999	**FY 2000**	**FY 2001**
Return on Assets <u>with</u> Smoothed Timber Sale (Bid) Prices (i.e., 5-year rolling average)			
Land Expectation Value (LEV) Calculation @ 4%			
Expected net income, 5-year rolling average[1]	$45,213,680	$44,926,420	$44,499,080
Land expectation value (LEV) @ 4%	$1,130,342,000	$1,123,160,500	$1,112,477,000
Land expectation value change ($_{t-1}$ to $_t$)	($169,627,000)	($7,181,500)	($10,683,500)
Total Return on Assets: Timber & Land (ROA_{T+L})			
Net income from forest land*	$66,426,300	$62,664,300	$52,225,400
Return on assets: timber income (ROA_T)	5.2%	5.7%	4.7%
Return on assets: land value change (ROA_L)	-13.0%	-0.7%	-1.0%
Total return on assets: (ROA_{T+L})	-7.9%	5.0%	3.7%
Return on Assets <u>without</u> Smoothed Timber Sale (Bid) Prices*			
Land Expectation Value (LEV) Calculation @ 4%			
Expected annual net income from timber*	$40,701,200	$49,590,800	$37,276,000
Land expectation value (LEV) @ 4%*	$1,017,530,000	$1,239,770,000	$931,900,000
Land expectation value change ($_{t-1}$ to $_t$)*	($60,032,500)	$222,240,000	($307,870,000)
Total Return on Assets: Timber & Land (ROA_{T+L})			
Net income from forest land*	$66,426,300	$62,664.300	$52,225,400
Return on assets: timber income (ROA_T)*	6.2%	6.2%	4.2%
Return on assets: land value change (ROA_L)*	-5.6%	21.8%	-24.8%
Total return on assets: (ROA_{T+L})*	0.6%	28.0%	-20.6%

* Indicates data presented or developed in Table 4-5.

Footnotes on source data and calculation methods:

[1] The current year's average bid price and previous four years' prices (source: IDL 2001c) are summed and divided by 5; cash expenditures for forest land management (source: IDL 2001b) have also been smoothed.

Until the Department of Lands and the Land Board have developed a feel for such relationships, it may be useful to do financial performance analysis with and without smoothed data.

4.6. Rate of Inventory Turnover (RIT): Efficiency of Forest Capital

The rate of inventory turnover (RIT) is a standard ratio used by financial analysts. A low turnover of assets suggests that there has been too heavy an investment in assets (Weston and Brigham 1981).

A useful technique for determining the efficiency of forest capital is to calculate the RIT. The higher the RIT, the more efficiently forest capital is being used (McKetta, review comments). The technique is simple. The "turnover" is the removal or reduction of inventory. Timber harvesting is the primary method of "turning" the forest growing stock inventory. The amount of annual timber harvest divided by the amount of standing timber inventory is the rate of inventory turnover (RIT).

Table 4-8 compares the RIT of the five major forest landowner classifications in Idaho for 1991, the most recent year for which data are available. State of Idaho endowment forest lands had an RIT intermediate between the federal land management agencies and private forest landowners. The federal lands managed by the U.S. Forest Service (national forest timberlands) and the BLM ("other public" timberlands) were below the state average of 1.1% RIT. Although the endowment lands had an above-average RIT of 2.5%, this turnover rate is substantially below private landowners, especially forest industry companies with a 4.1% RIT. This analysis also reveals that endowment forest lands carry an above-average amount of timber inventory on a per-acre basis, exceeding even that of national forest timberlands (Table 4-8).

Using Idaho Department of Lands inventory and harvest data for 1999-2001, the RIT for endowment lands averaged 3.3% in the 1999-2001 period (see Table 4-10 in **Part 4.9**).

4.7. Forestry Lessons From the Private Sector

It is useful to consider the history and prospects of forestry business in the private sector to put endowment forest land management in context. Growing trees for the purpose of producing timber to sell on the open market for a profit is a relatively new business in the U.S., not much more than 40 years

Table 4-8. Rate of inventory turnover (RIT) on Idaho timberlands by ownership classification, 1991.

	Ownership Classification					
	National Forest	State of Idaho	Other Public*	Forest Industry	Other Private	Total: All Owners
Timberland (thousands of acres)[#]	12,809	969	569	1,240	2,028	17,614
% of total for all owners	73%	5%	3%	7%	12%	100%
Timber inventory (mmbf)	109,598	8,480	3,805	8,620	11,067	141,570
Timber inventory per acre (board feet)	8,557	8,755	6,689	6,954	5,456	8,038
Removals from inventory (mmbf)	621.0	212.0	11.0	354.0	385.0	1,583
Removals per acre (board feet)	48.5	218.9	19.3	285.6	189.8	89.9
% of total for all owners	39%	13%	1%	22%	24%	100%
Rate of inventory turnover (RIT) (%)[£]	0.6%	2.5%	0.3%	4.1%	3.5%	1.1%

Abbreviations: mmbf = million board feet (Scribner scale).

* Other public: BLM (522,000 acres), misc. federal (39,900 acres), and county & municipal (6,600 acres).

[#] Does not include 3.8 million acres of Idaho national forests in the National Wilderness Preservation System.

[£] The rate of inventory turnover (RIT) is removals from inventory (which are mostly timber harvests) divided by the timber inventory. RIT is a measure of the efficiency of capital usage.

Source: all data from U.S. Forest Service forest inventory and analysis reports (all data from Brown and Chojnacky [1996], except State of Idaho data from Chojnacky [1995], Wilson & Van Hooser [1993]).

old (Vardaman 1989). Although investors and speculators have been buying, selling, cutting, and using trees for centuries, it was not clear in the U.S. that trees could be grown as a crop until shortly after World War II. By the 1980s, developments in timber management and silviculture as practiced by corporations in the forest products industry had won the confidence of institutional investors, the professionals who manage pension funds and insurance companies (Vardaman 1989). Industrial and institutional private sector timberland owners offer some lessons for public land management regarding financial performance. Not the least of these lessons is that environmental and social values are important to private timberland owners.

4.7.1. Lessons From Forest Industry Companies

Forest products and paper manufacturing firms own and control timberland for a variety of reasons. Historically important factors include security of wood supply, cost control, tax advantages, and earnings stability (Yin et al. 1998). Timberland investment provides profit (i.e., revenues in excess of costs) and protection against inflation (Vardaman 1989). There are different ways to measure investment returns (see **Part 3.2**), but most corporations use either net present value or the internal rate of return as their guide to forest investments (Gregory 1987).

In the private sector, measuring the financial performance of corporations with publicly-traded stock certificates of ownership is relatively simple (AIS 2000). Every day, investors measure performance by the value they place on shares of common stock traded in the market. Privately-held companies also answer to owners and a board of directors interested in the performance and value of the company. Forest products industry companies have been criticized for basing management decisions only on financial factors. However, pressures from shareholders as well as the public-at-large have caused many forest industry companies to incorporate other factors into managing the assets and resources under their control. Prominent among these are environmental considerations (AIS 2000).

Traditionally, forest products companies have owned timberland in order to ensure a sufficient supply of raw material at a controlled cost (O'Laughlin and Ellefson 1982). More recently some forest products companies have converted their timberland divisions from cost-center to profit-center status (Zinkhan et al. 1992). When forest management practices are oriented toward meeting the fiber demands of mills, minimizing costs, and/or maximizing overall company profits rather than producing timberland division profits, potential timberland returns may be concealed. In a corporate business setting, the returns from timberland often lose their identity (Zinkhan et al. 1992).

Many integrated forest products manufacturing companies no longer regard owning the land they manage as a prerequisite to financial success (Binkley et al. 1996). Under pressure from the investment community to improve financial performance, several firms have reorganized their timberland assets, and some have sold their timberlands to institutional investors (Yin et al. 1998).

The forest products industry is in the midst of a structural shift away from strong vertical integration—where the wood product and paper product manufacturers also own and manage their own timber resources—to more focused and separated investments (Whitaker et al. 1999). Some manufacturers are selling company timber assets outright, and others are entering into long-term lease relationships with timber investment partners. Recently, however, manufacturers have begun to treat their timberland assets more flexibly, with some companies tapping them as a source of earnings and capital. Ongoing sales and spin-offs of large tracts are expanding the inventory of property available for institutional investment (Whitaker et al. 1999).

4.7.2. Lessons From Institutional Investors in Timberlands

Many investment entities now recognize timberland as a legitimate investment (Zinkhan and Cubbage 2001). Institutional timberland-owning investors with fiduciary obligations include pension funds, universities, foundations, and trusts. Several institutions began to select timberland for its diversification potential in the early 1980s. The first pooled timberland fund for institutional investors began in 1981. By 1990 such entities held $1 billion in timberland assets. By 2001 this has grown to almost $8 billion. Institutional investors now hold about 4% of the total value of all privately-owned timberlands. Several timberland investment management organizations (TIMOs) raise capital from institutional and other investors and invest it in timberland. Investment managers expect the TIMOs to provide analysis similar to that generated by managers of common stock, bonds, and commercial real estate (Zinkhan

and Cubbage 2001).

Why do institutional investors hold timberland? The main attractions for institutional investments in timberland are strong returns, low risk, portfolio diversification, inflation sensitivity, and management flexibility; in other words, timberland is an appropriate investment for "patient capital" (Govoni 1993). Tax advantages may also be attractive (McKetta, review comments).

Concern for risk tempers the institutional investor's quest for high financial returns (Binkley et al. 1996). Sophisticated financial models help institutional fund managers and their advisors select combinations of investments that balance risk against return. Most institutional investors require that timberland be described in the same terms that financial analysts use to evaluate conventional investments such as stocks and bonds. Beginning in the early 1980s, forest economists began to provide this kind of information for timberland investments, with most of the effort focused on two questions (Binkley et al. 1996): [1] What role should timberland play in diversified investment portfolios? [2] How risky are timberland investments, and what risk-adjusted rate of return should they be required to generate? Replies to these questions follow.

Role of Timberland in Diversified Investment Portfolios. Timberland not only diversifies investment portfolios, it also offers relatively stable returns in comparison to alternative investments such as cropland and managed commodities (Zinkhan and Cubbage 2001). John Lord, managing director of Boston-based Prudential Timber Investments, said, "Several investors have used timber in their real estate allocations, because they feel this sector's outlook is much more favorable than for commercial properties" (Govoni 1993).

Risk, or the volatility of investment returns, tends to be modest for timberlands because a majority of the expected returns come from biological growth and "ingrowth"—the movement of timber into more valuable merchantability classes (e.g., from non-merchantable immature stock to pulpwood-sized material to small sawtimber to large sawtimber). Although historic returns on timberland have been less than for equities such as stock certificates, they generally have exceeded returns on higher-quality bonds. The returns have been high especially when considered relative to their modest volatility (Zinkhan and Cubbage 2001).

Relative to large capitalization stocks and corporate bonds, timberland returns smooth out fluctuations over time (Zinkhan and Cubbage 2001). Reasons for the relatively low volatility of returns associated with timberland include the steadiness of the biological and ingrowth components, the rather stable demand for a diversity of timber products, and the long-term nature of the investment (Zinkhan and Cubbage 2001).

For the period 1946-1988, data generated by Morgan Stanley Research indicated that timberland did not earn an average annual return as high as small capitalization stocks, foreign stocks, large capitalization stocks, farmland, or art, but did outperform many other popular investments, including residential real estate, commercial real estate, foreign bonds, gold, U.S. government bonds, and corporate bonds. Thus, timberland may be attractive to investors, even if they already possess other real estate holdings (Zinkhan et al. 1992).

Actual timberland investment performance examples are seldom published. One that was, according to Zinkhan et al. (1992), involved an institution that was pleasantly surprised by the performance of 30,000 acres in the Pacific Northwest. One estimate of this property's nominal rate of return from 1965 to 1989 was 15.2% per year. After adjusting for inflation, this was a real rate of return of 9.4% per year. By comparison, during the same period an "efficient" portfolio of financial assets, with moderate risk and deemed appropriate for this institutional investor, earned a 3.4% real annual rate of return (Zinkhan et al. 1992).

Riskiness of Timberland Returns. In financial analysis, risk generally refers to the variability of returns (Binkley et al. 1996). Because of their fiduciary responsibilities, institutional portfolio managers are cautious, reticent to invest in an asset they do not fully understand. Answering questions about risk and return is complicated by the fact that there is no continuous, centralized auction market such as the New York Stock Exchange to regularly price timberland assets and to monitor their returns. Analysts therefore have been forced to construct models of what the past performance of timberland might have been if someone had been able to observe and record the data (Binkley et al. 1996).

The basic approach forest economists use is similar to the conventional method for calculating the return to a stock. Return components are the change in stock price plus any dividend payment. To

provide hypothetical risk and return information, the analyst estimates the value of a prototypical timberland investment, usually a normal, or fully regulated, forest consisting of equal acreages in each age class up to some "optimal" rotation age (Binkley et al. 1996). Then the return to timberland investment can be estimated as the net timber harvest income plus the period-to-period change in asset value.

The body of research on the risks of timberland investing can be classified into three broad categories: [1] timberland as a portfolio asset, [2] risk at the stand-level, and [3] risk at the forest-level (Caulfield and Newman 1999). As a portfolio asset during various time periods from 1981 to 1996, timberland would receive a substantial asset allocation in optimized asset portfolios. Studies of risk at both the stand- and forest-level focus on risk as a factor in management decision making. This often takes the form of determining the optimal thinning regime, planting density, rotation age at the stand level, or harvest schedule at the forest level. Other such research considers adaptive management strategies in the face of product price risk in the marketplace (Caulfield and Newman 1999).

Except for some research on adaptive management strategies, many studies view risk in the long term, e.g., the expected net present value resulting from alternative management strategies measured over a rotation or some other multi-year holding period (Caulfield and Newman 1999). While much of the existing work has focused on price risks, a related area of stand-level risk research is concerned with the impact of catastrophic occurrences such as fire, hurricanes, and pests that can totally or partially obliterate a timber stand. Under a variety of modeling approaches, catastrophic risk can lower land expectation values and shorten rotation ages. This occurs because the probability of catastrophe effectively adds a risk premium to the discount rate, thus raising the opportunity cost on holding timber inventories (Caulfield and Newman 1999). Reducing expected cash flows for catastrophic risk probability, instead of the discount rate, is more appropriate (McKetta, review comments), but the overall effect on timber management would be the same.

Research on stand- and forest-level risk is rarely used by TIMOs (Caulfield and Newman 1999). Instead of optimizing forest management activities under risk, TIMOs tend to concentrate on adding value to investments by optimal land acquisition and disposition decisions. TIMOs also have the relatively short time horizons common to institutional investments versus existing risk models, and TIMOs often sell pieces of properties opportunistically (Caulfield and Newman 1999). One must therefore be cautious in comparing the management strategies and performance measures of institutional investors with other classes of timberland owners, including state trust land management agencies such as the Idaho Department of Lands.

Risk-Adjusted Discount Rates. Timberland investment research suggests that it is a "negative-risk" investment and therefore should be required to generate even less than the return earned by a risk-free asset (Binkley et al. 1996). Research also suggests that timberland has been undervalued, generating substantial excess returns given its low risk. However, these findings are to be interpreted with caution (Binkley et al. 1996). All or part of the apparent excess return for timberland may be accounted for by risk factors such as high transaction and information costs and illiquidity. The risk-adjusted discount rate for timberland investments also may be higher than research suggests. Institutional investors can accept some of these risk factors at little cost. For instance, a large pension fund that can accommodate illiquidity of a portion of its portfolio will benefit from owning timberland (Binkley et al. 1996). Similar results have been obtained by other researchers (e.g., Redmond and Cubbage 1988), with important implications not only for institutional investment in timberland, but also for any facet of timberland investment that requires the use of a discount rate (Zinkhan 1998).

4.7.3. Stewardship and Sustainability

Stewardship is defined by the Society of American Foresters as "the administration of land and associated resources in a manner that enables their passing on to future generations in a healthy condition" (Helms 1998). This definition links stewardship with sustainability. State trust land managers have a fiduciary responsibility to provide benefits in perpetuity, which means sustaining benefits indefinitely (Souder and Fairfax 1996). The Citizens' Committee (2001) report seemed to be somewhat critical of the emphasis the Idaho Department of Lands placed on stewardship (see **Part 3.6.4**). Financial performance is not only compatible with stewardship, over the long term it would be difficult to imagine how timberlands can be managed without adequate

concern for stewardship.

It is noteworthy that one of the leading TIMOs (HTRG 2001) considers stewardship essential for managing timberlands for its institutional clients:

> The Hancock Timber Resources Group (HTRG), a unit of John Hancock Insurance, was founded in 1985 by forest management and investment professionals. ... HTRG is both an investment fiduciary and a land steward. As fiduciaries, HTRG meets client obligations by prudent investment management according to objectives. HTRG has shown that timberland is a quality investment—one that can generate excellent performance and help reduce investors' portfolio risk by providing diversification. Those two objectives can best be achieved by practicing ***responsible forest stewardship***. ... Blending these two roles is a challenge, and essential to long-term investment performance that HTRG meets in many ways:
>
> 1. By empowering foresters to practice responsible *stewardship*;
> 2. By considering the forest's public resources, such as water, wildlife and recreational values, and managing them *sustainably*;
> 3. By listening to the public and working with interest groups to achieve business and *stewardship* goals; and
> 4. By educating clients about *stewardship* and how it adds value.
>
> HTRG's growth is proof that sound *stewardship* is good for forests and for business (HTRG 2001, emphasis added).

Without an emphasis on stewardship, endowment land management could be exposed to criticisms that its approach to meeting the mission mandate is inappropriate. Stewardship and financial return goals are not mutually exclusive (Bacon, review comments). The crux of the problem is determining an appropriate balance between long-term stewardship and financial return. The first step in doing so is to measure financial performance. Until now, IDL has not been asked to measure the financial return on asset value (Wiggins, review comments).

Because stewardship enables the passing on of resources to future generations in a "healthy" condition, sustainability of the resource base is a principal concern of resource managers. Trust land managers have a fiduciary responsibility to current and future beneficiaries that cannot be met without considering the long-term sustainability of management plans. PAG Report #19 (Cook and O'Laughlin 2000) thoroughly addressed timber harvesting in the ecological, economic, and social dimensions necessary for sustainable forest management. No conclusions specific to endowment lands were offered in that report.

4.7.4. Industry Restructuring

Looking ahead, some analysts are concerned that increasing pressure will develop to treat timberland like stocks, bonds, or other standard investments that are more likely to be whipsawed by speculation (Govoni 1993). Some even worry that investors may be unduly influenced by quarterly performance indices. Timberland does not lend itself to being measured that way, a TIMO CEO has said. Because many of the timber investment funds have eight- to ten-year investment horizons, the compiling of quarterly or yearly indices might put pressure on appraisers to pump up the volume of the funds, which may mislead timberland investors (Govoni 1993).

Timberland holdings of institutional investors are relatively modest when compared with holdings of forest products manufacturing or forest industry and "other private" landowners, but institutional holdings are expected to grow, and to dominate transactions in the market for timberland (Zinkhan and Cubbage 2001). For example, an estimated 16.2 million acres of forest industry timberland (23% of the industry's total U.S. land base) was sold or included in some form of "securitization" restructuring between 1996 and 1998, at an average price of $700 per acre. Securitization creates some form of transferable shares of equity in the timberland and generally leaves the control of the acreage with the forest products company (Zinkhan and Cubbage 2001).

Forestry Implications. The practice of forestry will be affected as nontraditional investors in timberlands offer a new opportunity for forest stewardship (Binkley et al. 1996). Although institutional investors may impose cashflow targets on TIMOs, forest management institutions generally focus on maximizing the asset value of the forest (Binkley et al. 1996).

Meeting financial objectives of timberland investment may alter the forest sector as a whole (Binkley et al. 1996). For example, in order to meet

cash flow constraints in times of economic downturn, forest industry companies may find themselves cutting timber that would optimally be harvested later. This means more timber enters the market in an economic downturn than otherwise would be the case. This perverse supply response exacerbates declines in timberland profitability that always attend downward shifts of demand (Binkley et al. 1996).

Institutional investors are apt to be a bit more patient in their timber sales decisions than forest products manufacturers (Binkley et al. 1996). Not needing to meet hard annual cash flow targets, one would expect nontraditional owners to put less timber on the markets at times of economic downturn. If all other things were equal, this change in the supply response will reduce the volatility of prices and reduce the risks associated with timberland ownership (Binkley et al. 1996).

4.8. Environmental and Social Considerations

Managers of state trust lands do not have to worry about their company surviving; however, public sector managers can learn from the efforts of private companies to balance financial, environmental, and social elements, keeping in mind the needs of their beneficiaries rather than shareholders (AIS 2000). As mentioned earlier, forest products companies have had to make adjustments to meet environmental and social considerations. State trust land managers must do the same. According to the Idaho Department of Lands, future social and environmental constraints could affect harvest levels (IDL 2000b).

Research on state trust lands has shown that even if revenue maximization is the controlling notion, numerous choices that managers confront can be used to create room for diverse additional general benefits (Souder and Fairfax 1996). The manager, while emphasizing revenue generation, has to decide what type and quality of product to sustain. There is a general question as to what revenue maximization entails in forestry programs. Different decisions on that issue can lead to different results. The timing of flows of timber from state trust forest lands will produce revenue fluctuations. Within the broad context of forestry oriented toward timber production and revenue generation, there are diverse opportunities for assessing and achieving general public benefits (Souder and Fairfax 1996).

State trust land managers are required to maintain environmental quality by complying with state forest practices regulations. Different aspects of state forest practices regulations (Table 4-9) suggest the environmental considerations involved in managing lands for timber production (AIS 2000). Administrative procedures are concerned with the plan and implementation of a timber program. Some states may include an environmental assessment of the proposed activity. Timber harvesting standards address the potential for soil erosion, the ability of the ecosystem to recover from silvicultural regimes

Table 4-9. Common aspects of state regulations of forest practices.

Administrative Procedures	Written plan requirements, administrative review, site inspections, etc.
Timber Harvesting Standards	Limits on clear-cut sizes, timing, guidelines for debris removal, suggested techniques on sloped areas, etc.
Transportation Standards	Road, skid trail, and landing construction, and maintenance to control for erosion and sedimentation.
Reforestation Standards	Minimum stocking standards, recommended techniques by tree species, and reporting procedures.
Sensitive Resource Standards	Special rules for riparian areas, endangered species, and other sensitive wildlife habitats.
Enforcement	Enforcement and notification of violations.

Source: Ellefson et al. (1997), as presented in *Trust Performance Meaurement* (AIS 2000).

designed to produce timber and provide regeneration, including clearcutting techniques, and the reduction of secondary effects from the removal of logs and debris. Transportation and forest access standards also address potential soil erosion from runoff due to inadequate road construction and maintenance. In addition, adequate road access ensures that heavy equipment has access, with minimal damage, to planned timber harvest areas. Reforestation standards address species and age diversity as well as replanting densities necessary to regenerate a healthy ecosystem. Protection of riparian areas assures water recharge and protection of water quality and quantity (AIS 2000), but water resources are impacted by more than what happens in riparian areas.

Fire management is another important consideration for sustainable forest management (AIS 2000). Past management plans for preventing and controlling forest fires have created excessive biomass loads, thereby increasing the risk of extensive and high-intensity wildfires. Prescriptive use of controlled burns as a management tool is becoming an increasingly important management tool. For example, an excess number of dead trees in a stand, or stand densities that exceed the optimum as identified by U.S. Forest Service indices for given soil and climatic conditions, can be used as fire management indicators (AIS 2000).

Scenic value often increases bid prices for forests (Klemperer 1996). Thus, seemingly unmarketed outputs can actually have market prices per acre. However, the value must accrue to the buyer of timberland not society in general, in order to affect forest market prices (Klemperer 1996). Scenic values associated with Idaho endowment lands may involve opportunity costs of reduced or deferred timber harvest that management plans can address.

Performance Criteria and Indicators. The management decision process and performance measures must meet the needs of the state trust land beneficiaries (AIS 2000). Financial criteria and indicators are basic measures of changes in measurable financial benefits. Environmental and social performance measures chronicle long-term and cumulative impacts on the land. These criteria and indicators can be described as having either a positive, negative, or neutral impact on future cash flow and asset value. When viewed over time, performance measures help both the trust manager and the beneficiaries understand and quantify trends. An understanding of the relationship between financial, environmental, and social factors will assist both the manager and beneficiary, and when required, will assist in explaining policy and programs to local and statewide political leadership, as well as to the general public (AIS 2000).

Table 3-1, presented in **Part 3.6.3**, provides examples of criteria and indicators recommended in the AIS (2000) report to the Western States Land Commissioners Association on *Trust Performance Measurement*. These performance measures are basic means to measure gain or loss, usually measured on the total portfolio, groupings of similar assets, or on a regional basis (AIS 2000):

4.9. Summary and Conclusions

Forests are a store of wealth, or capital, as well as the source of many non-monetary values. Forest capital is the timber portion of the trees in the forest, plus the land upon which the forest grows. Like any other capital asset, analytical techniques based on discounted cash flow analysis provide useful management information. It is also possible to address non-monetary values using financial analysis, especially through the concept of opportunity costs. But first, it is useful to consider the forest as a financial asset. Idaho endowment forest land statistics and financial performance indicators are summarized in Table 4-10.

The monetary value of a forest is most often considered to be *timber* and *land*. Timber value is increased by the biological growth of trees, and affected by timber stumpage values. Stumpage prices are determined in a market and therefore subject to changes arising from supply and demand variables. The value of forest lands is very sensitive to changes in stumpage prices (Table 4-10).

The 994,189 acres of Idaho endowment forest lands consist of approximately 480,000 acres of high- and medium-productivity sites that can be managed to provide 4% annual timber growth per year at cutting ages in the 55-70 year range. There are also approximately 280,000 acres of low-productivity sites that take at least 80 years to reach a 4% annual growth rate level; and approximately 230,000 acres of secondary forest lands that are generally not considered available for timber management purposes.

Regional stumpage market projections on average increase 3% per year in real terms for the next 20 years, and then taper off so that over the next 50 years, the average annual increase is 1.2%

(data from USDA Forest Service 2001). However, we caution against including stumpage price appreciation in discounted cash flow formulas used to guide timber management decision making or appraisal of endowment lands asset value.

Land asset performance depends not only on the net income produced, but also how the asset value is determined and how that value changes over time. Foresters solve this valuation problem with a discounted cash flow technique called the land expectation value (LEV). The LEV assumes a series of identical cash flows will be produced periodically in perpetuity. The LEV can be calculated if a series of identical cash flows occurs periodically, either every year, or more infrequently.

The value of Idaho endowment forest lands for timber production is $1 billion at a 4% discount rate to determine LEV. The ROA from timber income is 5.7%. At a 6% discount rate, the LEV is $700 million, and the timber income ROA is 8.5%.

The Idaho Department of Lands manages the endowment forest lands using a sustained yield management strategy for timber products, with the idea of producing approximately the same amount of timber each year. Using the LEV to appraise the value of all endowment forest lands, it is not possible to separate the value of timber from the value of land, as both timber and land are jointly part of the timber producing "factory" under the management strategy employed by the Department of Lands.

Although higher discount rates seem to make the ROA look more favorable, before a target rate is selected as a matter of operating policy, the effects of the choice of an interest rate on timber stand management need consideration. The higher the target rate, the earlier trees will be cut.

The Department is beginning to use LEV to determine the value of endowment forest lands for performance evaluation purposes (Wiggins, personal communication). The "maximum long term financial return" goal of the Idaho Constitution could be attained more effectively if managers viewed land as a *fiscal*, not *physical*, asset. With the LEV, the Department then can use a total return approach to evaluate asset performance. This is the net income received from timber sales for a given year, plus the change in the value of the land that year, with the sum divided by the value of the land in the previous year. This is the total return on assets approach recommended in the forestry economics literature (Binkley et al. 1996, Klemperer 1996). The same approach is used by institutional investors in timberlands, including pension funds and other "patient" investors who now own millions of acres of timberlands with an estimated value of $7.6 billion (HTRG 2001).

The value of Idaho endowment forest lands for timber production in 1999-2001 is $1 billion at a 4% discount rate to determine LEV. The ROA from timber income is 5.7%. At a 6% discount rate, the LEV is $700 million, and the timber income ROA is 8.5% (Table 4-10). Unrealized returns in the form of gains or losses from changes in LEVs from year to year are -8.6%, reflecting generally declining stumpage prices in the 1998-2001 period. The LEV changes drive the total ROA slightly negative, with -2.9% at a 4% discount rate and -0.1% at a 6% rate (Table 4-10). A 5-year rolling average of stumpage prices would dampen the variability in LEV considerably, without changing the return on assets from timber income very much.

Sensitivity analysis reveals that a higher target rate would result in a higher return on asset value from timber income simply because the LEV would be lower. Although higher discount rates seem to make the ROA look more favorable, before a target rate is selected as a matter of operating policy, the effects of the choice of an interest rate on timber stand management need consideration. The higher the target rate, the earlier trees will be cut. A target rate of 4% is likely to result in cutting ages of 55-70 years on high- and medium-productivity sites. Current cutting ages of 80+ years translate into an implicit target rate of less than 2%. Because of timber growth characteristics, a target rate of 4% on low-productivity sites takes 80 or more years, and will provide low timber volumes.

Table 4-10. Summary statistics and financial performance indicators, Idaho endowment forest land, FY 1999-2001.

	Statistics and Performance Indicators	FY 1999	FY 2000	FY 2001	Average
(a)	Primary forest land acres	758,112	758,112	758,112	758,112
(b)	Total forest land acres	994,189	994,189	994,189	994,189
(c)	Timber inventory, primary forest land	7.315 bbf	7.315 bbf	7.315 bbf	7.315 bbf
(d)	Long-term sustained-yield harvest	186 mmbf	186 mmbf	186 mmbf	186 mmbf
(e)	Timber sold	181.6 mmbf	192.8 mmbf	191.6 mmbf	188.7 mmbf
(f)	Timber harvested	266.5 mmbf	239.2 mmbf	221.5 mmbf	242.2 mmbf
(g)	Rate of inventory turnover (RIT) (%)[1]	3.6%	3.3%	3.0%	3.3%
(h)	Stumpage price (bid) for timber sold	$267 / mbf	$319 / mbf	$248 / mbf	$278 / mbf
(i)	Stumpage price (paid) for timber harvested	$252 / mbf	$262 / mbf	$236 / mbf	$250 / mbf
(j)	Interest on timber sold and uncut[#]	m.d.[#]	m.d.[#]	m.d.[#]	m.d.[#]
(k)	Cash income from timber	$75,387,100	$72,407,500	$61,077,400	$69,624,000
(l)	Cash expenditures for management	$8,960,800	$9,743,200	$8,852,000	$9,185,333
(m)	Net income	$66,426,300	$62,664,300	$52,225,400	$60,438,667
(n)	Net income per acre, primary forest land	$88 / ac.	$83 / ac.	$69 / ac.	$80 / ac.
(o)	Net income per acre, all forest land	$67 / ac.	$63 / ac.	$53 / ac.	$61 / ac.
(p)	Change in net income (year-to-year %)	9.3%	-5.7%	-16.7%	-4.4%
(q)	Cash expenditures as % of cash income	11.9%	13.5%	14.5%	13.2%
(r)	Expected net income from timber[2]	$49,662,000	$59,334,000	$46,128,000	$42,522,667
(s)	Land expectation value (LEV) @ 4%[3]	$1,017,530,000	$1,239,770,000	$931,900,000	$1,063,066,675
(t)	LEV per acre, primary forest land @ 4%	$1,342 / ac.	$1,635 / ac.	$1,229 / ac.	$1,402 / ac.
(u)	LEV per acre, all forest land @ 4%	$1,023 / ac.	$1,247 / ac.	$937 / ac.	$1,069 / ac.
(v)	Return on assets, timber income(ROA_T)[4]	6.2%	6.2%	4.2%	5.7%
(w)	Return on assets, land value (ROA_L)[5]	-5.6%	21.8%	-24.8%	-8.6%
(x)	Total return on assets (ROA_{T+L})*	0.6%	28.0%	-20.6%	-2.9%
(y)	Land expectation value (LEV) @ 6%	$678,353,333	$826,513,333	$621,266,667	$708,771,117
(z)	LEV per acre, primary forest land @ 6%	$895 / ac.	$1,090 / ac.	$819 / ac.	$935 / ac.
(aa)	LEV per acre, all forest land @ 6%	$682 / ac.	$831 / ac.	$625 / ac.	$713 / ac.
(bb)	Return on assets, timber income(ROA_T)	9.2%	9.2%	6.3%	8.5%
(cc)	Return on assets, land value (ROA_L)	-5.6%	21.8%	-24.8%	-8.6%
(dd)	Total return on assets (ROA_{T+L})*	3.7%	31.1%	-18.5%	-0.1%

Abbreviations: ac. = acres; bbf = billion board feet; mmbf = million board feet; mbf = thousand board feet; m.d. = missing data.

* See Table 4-5 for all steps in ROA calculation.

[#] Part of the net income is derived from 6% interest paid by timber purchasers until timber is harvested. A full accounting of financial performance would break this out as a line item, as it is several million dollars per year.

Footnotes summarizing calculation methods:

[1] (f) / (c) x 100

[2] (d) x (h)

[3] (r) / .04

[4] ((m) / (s) for previous year) x 100

[5] ((s) - (s) for previous year) / ((s) for previous year) x 100

Part 5. Rangeland as a Financial Asset

Rangelands provide a source of income to the Endowment Fund through lease payments received for livestock forage. Rangelands provide other benefits as well. Neither the forage output of public lands nor the other benefits of public rangelands lend themselves easily to valuation techniques (Bartlett 1984, Dyer 1984, Bartlett et al. 2001). Fair market values for public lands forage are elusive because grazing is not allocated by a true market system (Bartlett 1984).

Idaho's state endowment lands include 1,837,658 acres identified as leased rangeland (IDL 2000a). In 2000, these lands netted income of 17 cents per acre from grazing leases; from 1992-2000, endowment rangelands averaged net income of 23 cents per acre per year (from data in IDL 2001b). Similar to forest lands, the question is whether this level of income is an adequate financial return on the value of the land asset. To develop a reply, we use an *income capitalization* appraisal approach. The net revenue in 2000 results in a land expectation value of $8 million at a 4% discount rate, or $4.36 per acre. The current level of net income is based on a grazing fee ($4.75/AUM) that is below the fair market value of forage. Although elusive, published evidence indicates that an estimate of fair market value of endowment land forage in 2000 is $7.63 per AUM, which at a 4% discount rate would be a land expectation value of $26 million, or $14. 09 per acre. We do not offer an argument that endowment land grazing fees should be higher, but we do feel that it is unrealistic, if not unfair to trust beneficiaries, to evaluate the financial performance of these lands by using administratively determined forage values to determine asset value of these lands for producing forage, which is necessary to calculate the return on asset value.

The value of the public rangeland asset is elusive for many reasons, including the pricing of state and federal grazing fees below the market value of the forage.

The value of public rangeland assets is elusive for many reasons, including the pricing of state and federal grazing fees below the market value of the forage (Torell and Doll 1991). Many parcels of state grazing land are small and surrounded by federal grazing lands, which affects access to them and their value. Determination of a fair market value of rangelands is complicated by the importance to many ranchers of the ranch quality-of-life as well as land value appreciation (Sunderman and Spahr 1994, Torell et al. 2001b). Net income from livestock production is less important to many ranchers than other factors (Workman 1986, Torell and Bailey 2000, Torell et al. 2001a).

If receiving fair market value for leasing state trust rangelands for grazing is a goal of managers, then an important question is, what is the fair market value of the state land, and associated infrastructure, to a lessee? (Souder and Fairfax 1996). Many variables affect the value of land for grazing, including current market conditions, size of parcel, access, rainfall, range condition, topography, water distribution, fencing, and other potential uses such as homesite (IDL 2000a). Having said this, the Department of Lands "2000 Asset Valuation Report" (IDL 2000a) made no attempt to determine a value for this class of assets.

Rangelands produce a variety of non-financial values in addition to livestock forage that also are considered in managerial decisions. A financial analysis provides a starting place for such considerations by identifying the values of market products, which can then be used to represent opportunity costs of non-market benefits in trade-off decisions. The opportunity cost approach can also reveal what is being forfeited by selecting financial returns as the primary management objective, but opportunity cost is not a valuation method for the rangeland asset (Gardner 1984). Without a value estimate of the endowment rangelands it is not possible to assess the financial performance of these lands using rate of return on asset value. Determining the fair market value of forage production, and using it to appraise the value of endowment rangelands, is the starting point.

The *income capitalization* appraisal method used for determining the land expectation value is appropriate for endowment lands, but only to the extent that the grazing fee represents a fair market value. Range economics literature provides evidence that it does not.

There are more than 4 million acres of private rangelands in Idaho. A *sales comparison* of private market-priced forage and feed sources may be a useful valuation method (Bartlett 1984); however, the services provided under private leases are different than those provided by state leases (Rimbey et al. 1994, Bartlett et al. 2001). What data we could find (USDA-NASS 2001a) indicated that private

lease rates for forage are double those obtained from endowment leases.

It may be possible to arrive at a fair market value of forage, and the subsequent setting of grazing fees, by using two variations of the *replacement cost* method of appraisal. One variation is the *contributory value* method recommended in the book *State Trust Lands* by Souder and Fairfax (1996), who favor a *cattle price share* method of determining value. Another variation is based on ranch owner-operator earnings, which relies on operations research aimed at developing representative ranch budgets and has been done in Owyhee County (Rimbey et al. 1999, 2001). Valuing the bare land component of endowment rangelands is more problematic, as it involves accounting for ranch quality-of-life values that increase forage values beyond their value for livestock production (Bartlett et al. 2001).

We make no effort to attempt these *replacement cost* appraisal methods, but would encourage others to do so. Instead we adjust published data on private lease rates for forage, using the range economics literature for guidance.

The problem with the total return evaluation method for rangeland is estimating the value of the land asset base.

5.1. Rate of Return Components: Grazing Leases and Land Value

Returns to investments in rangeland are from annual net income and land value appreciation (Workman 1986). The financial return on assets for endowment rangelands is the net income from grazing leases in a given year plus the increase in land value from last year (or minus the decrease in value) divided by the land value from last year. This is the total return approach to evaluate endowment lands (see **Part 3.4.2** and its application to forest lands in **Part 4.5.**). The total return method captures both sources of returns to grazing land. Annual revenues from rangeland are provided by lease payments for using an identified parcel of land for grazing a particular number of animal unit months (AUMs) for which grazing fees are assessed. From this revenue, annual net income is determined by deducting management expenses. Land value is appraised using the land expectation value (LEV), an *income capitalization* method (see **Part 3.2** and its application to forest lands in **Part 4.4.4**).

The grazing fee upon which lease payments are based will likely continue to reflect a combination of political, social, and market factors.

The total return formula for determining the return on assets for any land asset class is:

$$ROA_t = \frac{(R_t - C_t) + (V_t - V_{t-1})}{V_{t-1}}$$

where:

ROA_t = Return on assets in year t
R_t = Revenues in year t
C_t = Costs in year t
V_t = Value of land asset base in year t
V_{t-1} = Value of land asset base in the previous year (i.e., t-1)

The problem with the total return evaluation method for rangeland, as described above, is estimating the value of the land asset base (V_t above). The remainder of this part of this chapter explains why that is so, and why it is difficult to change the situation. Also provided are methods to develop the information for determining grazing fees that reflect fair market value.

5.1.1. Grazing Leases

Idaho leases its endowment rangelands to private ranchers. The lease rate is determined by the number of animal unit months (AUMs) a parcel of land supports times a fee derived from the formula for determining grazing fees on federal lands, as the Land Board has modified it. Idaho's fee ($4.75 per AUM in 2000) is more than three times higher than the fee on federal grazing lands ($1.35 per AUM in 2000) (IDL 2000b). By comparison, private lease rates in Idaho in 2000 averaged $10.90 per AUM (USDA-NASS 2001a). The services provided by private leases are usually different than those provided in public leases (Rimbey et al. 1994). Like federal lands, the appropriate fee for grazing state endowment rangelands will continue to be controversial. The grazing fee upon which lease payments are based will likely continue to reflect a combination of political, social, and market factors.

The relationship between the trustee—in this case, the Idaho Department of Lands and Land

Board acting on behalf of the designated trust beneficiaries—and users who lease trust lands is defined by the terms of the leasing arrangements (Souder and Fairfax 1996). These administrative arrangements are indications of the degree to which a state has control over its leases. How a lessee obtains a lease and what rights and obligations are attached to the lease are important questions. These obligations are frequently identified as having a causal relationship with the fees for leasing the lands. The determination of these rights and obligations therefore may affect value. How the lease is obtained frequently determines whether a state gets fair market value for it. How the obligations of the lessee are valued determines how much the lease is worth to the lessee. The key to successful leasing procedures depends on striking a balance between attracting industrious lessees and obtaining the highest return from the lands (Souder and Fairfax 1996).

There are a number of issues associated with leasing procedures identified and described in the research on state trust land management conducted by Souder and Fairfax (1996). Summaries of their findings are presented in the following sections, supplemented with ideas from additional materials.

How a Lease is Obtained and Held. Obtaining a grazing lease is the first step in the relationship between a state as landowner and the lessee as developer of the resource (Souder and Fairfax 1996). One specific provision is the bidding procedure, starting with whether competitive bidding is possible. Another is whether a preference right to a lease exists and, if so, whether it depends on owning "base property," defined as the ownership of nearby property (Cody and Baldwin 1998). A third provision is how the existing lessee can transfer either the lease itself or its value to others. Last is the provision for a state to recover the lease for other uses or for nonpayment of fees. The comparison of practices among states reveals not only the diversity of approaches states use in determining how to obtain leases, but also suggests windows of opportunity through which states can increase their revenues (Souder and Fairfax 1996). Suggestions from the literature for potential improvements in leasing arrangements are provided in **Part 7.3**.

Bidding Procedures and Fair Market Value. Identifying who can obtain a state grazing lease is a determining factor in whether a state obtains fair market value (Souder and Fairfax 1996). Fair market value represents the amount for which the lease would change hands between a willing, knowledgeable buyer and a similarly situated seller on the open market. There are three operative criteria for analyzing the competitive nature of a state's grazing leases:

1. Is either party under any compulsion to buy or sell?
2. Is the planned grazing the highest and most profitable use?
3. Is the lease offered for sale in the open market?

Collectively these three traditional appraisal qualifications determine whether a state's leasing procedures allow it to obtain fair market value (Souder and Fairfax 1996). The questions posed above, and those immediately following, would be considerations for the portion of an asset management plan addressing resource-specific policies (see **Part 2.6**).

The connection between the competitive nature of state grazing leases and a state's ability to obtain fair market value for the leases can be discerned by considering a series of questions (Souder and Fairfax 1996):

1. What are the requirements for potential lessees, and do these requirements limit the ability of the state to maximize long-term income from the leases?
2. What measures does the state take to market its leases or to manage its lands so that the highest number of potential bidders is available?
3. When leases are auctioned, is the process set up so that potential bidders are encouraged not only to bid, but also to bid the maximum value of the forage to them?

The Idaho Constitution requires that leasing and other management activities on state endowment lands provide "maximum long term financial return" to the trust beneficiaries (Idaho Constitution, Article 8, Section 8); however, neither the Idaho Constitution nor Idaho statutes require that grazing lease rates be set at fair market value. Grazing lease rates are set at the discretion of the Land Board (Idaho Code § 58-304). In 1993, the Land Board approved a formula for determining grazing fees (see **Part 5.1.3**). Fees were $4.75 per AUM in 2000, $4.95 in 2001, and will be $4.96 in 2002 (IDL 2001e).

State grazing lands in Idaho are normally leased for a 10-year period, although they may be leased for shorter terms (IDAPA 2001a). The annual lease payment is based on the number of AUMs for which the land parcel is used times the grazing fee per AUM. The only time competitive bidding occurs is when two or more applicants apply to lease the same land, in which case a "conflict auction" takes place (Idaho Code § 58-310). The premium that may result from the conflict auction is a one-time, lump-sum payment and does not affect the annual lease payments for grazing.

According to Idaho statutes, the Land Board is not required to award the grazing lease to the highest bidder in a conflict auction. Criteria that may be considered by the Land Board in deciding to whom to award the lease include, but are not limited to:

- whether an applicant's grazing management plan meets the standards of the Idaho Department of Lands,
- whether the current lessee controls enough other grazing land to feed his/her livestock,
- whether the current lessee's ranching operation can remain economically viable without the state land lease,
- future revenues to the beneficiaries of the endowment,
- the indirect benefits to the beneficiaries from tax revenues associated with the lessee's ranching activities, and
- the impacts on the land or the return to the endowment fund if the land is not managed in conjunction with adjacent grazing lands (Idaho Code § 58-310B(6)).

Rights in the Lease. When a lessee obtains a lease from a state, certain rights come with it (Souder and Fairfax 1996). These rights are generally described by the legal term *leasehold interest*—the rights and privileges that the lessee of property has by virtue of the nature of the lease. Generally, the lessee is granted use of the property for a certain number of years. In Idaho, that period generally is 10 years. In some cases the lessee has a preference right to renew the lease, as well as the right to transfer the lease to others (Souder and Fairfax 1996). In Idaho, the current leaseholder does not have a preference right, but can be afforded preferential treatment in the Land Board's decision of who receives a lease when a conflict auction occurs (Idaho Code § 58-310B).

States approach the issue of subleasing differently, and vary as to whether additional fees or revenue-sharing requirements are imposed (Baldwin and Cody 1996). Some states that charge "fair market value" for grazing leases take the position that if an allotment can be subleased at a profit, that is evidence that the rental fees charged by the state should be raised; other states are less concerned with the revenue issue (Baldwin and Cody 1996).

In Idaho, a lessee must obtain written consent from the IDL director before subleasing his/her state grazing lease, and must pay a one-time administrative fee (IDAPA 2001a). There is no requirement that the lessee share revenues from the sublease with the state. A lessee also can transfer all his/her rights to another person, whereby the second person assumes the lease contract with the state (IDAPA 2001a). This "assignment" of lease rights must be approved by the IDL director.

If all or portions of a leased property are taken by a state for other uses, the lessee has some rights to compensation, which vary from state to state (Souder and Fairfax 1996). Because the bundle of rights attached to a lease has value to both the lessee and the state, the criteria the various states use to define that bundle are worth examining (Souder and Fairfax 1996).

Improvements. An improvement is: "A valuable addition made to property (usually real estate) or an amelioration in its condition, amounting to more than mere repairs or replacement, costing labor or capital, and intended to enhance its value, beauty or utility or to adapt it for new or further purposes" (Souder and Fairfax 1996). Who pays for improvements, and how these are dealt with at lease termination are important considerations for both the lessee and the trustee. Important issues include how various types of improvements are distinguished, what cost-share mechanisms are in place, who approves improvements, and how improvements affect competition for leases (Souder and Fairfax 1996). There is considerable variation among states with respect to titling and sharing the costs of range improvements such as fences, structures, and water improvements (Baldwin and Cody 1996).

The way improvements to the leased lands are handled affects their value (Souder and Fairfax 1996). Typically, more significant improvements are titled in the name of the state. Additionally, title to water rights is almost universally retained in the name of the state. Because livestock grazing is

allowed only by permit or lease, it is appropriate for the state to hold the water rights in the underlying legal estate (Baldwin and Cody 1996).

In Idaho, a lessee must obtain written permission from the IDL director before making an improvement. Any arrangement for cost sharing or improvement crediting must be expressly stated in the improvement permit. A bond may be required if there is a risk of damage to state lands. Lessees are required to maintain improvements and bear the cost for doing so (IDAPA 2001a).

In Idaho, if a lessee loses a lease either because of a land sale, conflict lease auction, or land exchange, he or she receives "improvement credit" if the improvement would be valuable to someone who might use the land for the same purpose. Improvement credits are paid in cash (IDAPA 2001a). Improvements are valued on the basis of current new *replacement cost* less actual depreciation (IDAPA 2001a). Ownership of fences is determined by statutory provisions (Idaho Code § 35-100 et seq.). Idaho retains the water rights for leased lands (IDAPA 2001a).

Reversion and Leasehold Interests. The combination of the lessees's rights in the lease and the compensable improvements affect how a state handles the lease when it decides to change the use of the leased land (Souder and Fairfax 1996). A number of different situations may lead a state to use its lands for some other purpose than the existing grazing use. The parcel could perhaps be part of a land sale or exchange. In situations where oil and gas or other mineral rights development involves extraction of subsurface resources, a state may require that portions of the surface be occupied by the subsurface lessee. Situations may also arise where grazing use is superceded by another, higher-valued surface use, such as commercial development, communications sites, roads, or pipelines. When a state initiates a land-use change, the typical lessee is interested in two kinds of compensation: the value of the improvements, and the value of the *leasehold interest* in excess of the value of the improvements. The existing lessee is generally compensated for improvements, and states also generally refund any prepaid rent (Souder and Fairfax 1996).

Leasehold interest means the "rights to the use and occupancy of the property subject to various obligations, [and] ... is said to have value when contract rent is less than market rent, which is the amount a property could earn in a competitive real estate market" (Souder and Fairfax 1996). The leasehold interest is much more controversial than the value of improvements. States generally do not concede that the lessee has a leasehold interest beyond the value of approved improvements and prepaid rent. Some states explicitly specify in their statues, rules, or lease forms that no leasehold value is allowed. Other states remain silent on this question, following the federal practice of not acknowledging the leasehold interest but accommodating it when it is pressed. According to Souder and Fairfax (1996), the primary reason states are unwilling to acknowledge a leasehold value is because it indicates that rental rates are below market value, which is prohibited by the trust concept. Nonetheless, there is considerable evidence that leasehold values exist (see Bartlett et al. 2001). Whether the states acknowledge these values or not, bankers finance loans based on their existence (Souder and Fairfax 1996).

In Idaho, grazing leases can be cancelled due to resource damage, reclassification to a higher use, or sale of the endowment land (IDAPA 2001a). When a lease is cancelled or changes hands as a result of a conflict auction, the state compensates the lessee for the value of improvements, as described above, but not for any leasehold interest value in excess of the value of improvements.

Analysis of trust land grazing programs across the West suggests that most of the rights inure to the lessee, and not necessarily to the benefit of the trust (Souder and Fairfax 1996). Specifically, states relinquish control over leased property when they allow for preference rights, collateral assignments, subleasing, and compensation to the lessee for the undepreciated replacement value of improvements. States, and their trusts, gain control of leases [a] when they open the bidding process through competitive leases whose availability is broadly advertised; [b] when they disallow collateral lease assignments, since there should be no value left if fees reflect full market value; and [c] when they either require the existing lessee to remove improvements at the end of the lease term or require the future lessee to pay only the appraised fair market value for improvements that are useful to future lessees (Souder and Fairfax 1996).

5.1.2. Land Value

The value of endowment land for grazing is related to the fair market value of forage, not the fee set to

determine how much ranchers pay for grazing leases. Fair market values of state and federal forage, grazing fees, grazing leases, and the land used for grazing are elusive.

Because federal grazing allotments are associated with a base property and are not competitively bid, permits and leases for federal lands grazing have taken on an assumed value of their own (Cody and Baldwin 1998). The federal government has explicitly stated that private livestock grazing on federal lands is a privilege, and is neither a right nor an interest in property. Nonetheless, ranches with access to federal forage often sell for a higher price than they would without access to federal rangelands. The result is that the value of the grazing preference is capitalized into the net worth of the ranch base property and is considered as an asset by the rancher (Cody and Baldwin 1998). State grazing leases also have grazing preference value that is capitalized into ranch values (Torell and Doll 1991; Rimbey, review comments).

The value of endowment land for grazing is related to the fair market value of forage, not the fee set to determine how much ranchers pay for grazing leases.

In addition to net ranch income, an investor in rangeland may expect a speculative return in the form of increased land prices. Land value changes as a measure of return are at least as important as annual net ranch income (Workman 1986). It is therefore appropriate to use the total return concept in estimating the return on private rangeland assets, and thus appropriate for endowment lands, too.

In summary, it is difficult to estimate fair market value of forage produced on state lands because state and private land grazing fees or lease rates are not directly comparable (Cody and Baldwin 1998). Private range leasing is generally competitive, with relatively easy access, and prices are set by supply and demand. In contrast, access to state rangeland may be limited, and state land leases can be awarded based on ownership or control of adjacent lands. Also, private lands often provide water, fencing, and other amenities, which state leases often do not. Although some fair market value estimates of state grazing leases attempt to account for these differences, such estimates are problematic without some type of competitive market mechanism (Bartlett et al. 1993, 2001). Consequently, disputes about the accuracy and validity of such estimates persist (Cody and Baldwin 1998, Bartlett et al. 2001). Nevertheless we will estimate the fair market value of forage on state lands by relying on findings in the literature. Without a defensible estimate of the market value of forage, financial performance measures for endowment lands make little sense in the context of "maximum long term financial return" for trust beneficiaries, as required by the Idaho Constitution.

Appraisal Methods. If a state's goal is to charge fair market value for the rental paid by the lessee to the state, then fair market values for state leases need to be determined by some appraisal method. Appraisals also can be used to establish a "base value" for leases (Souder and Fairfax 1996). If auctions are held, the appraised value could become the minimum bid allowed. Because some parcels of trust lands may receive only a single bid at auction, the appraised base value often may become the amount the state receives for the lease (Souder and Fairfax 1996).

Idaho state law authorizes the Land Board to have land appraisals conducted whenever and however it wishes (Idaho Code § 58-301). Appraisals are required only when lands are to be sold or exchanged. Idaho used appraisals in the 1970s and 1980s to set annual state land lease rates (Rimbey, review comments), but does not now.

Several empirical approaches have been used in the attempt to set grazing fees based on the marginal productivity value of range forage: [1] *comparable sales* of market-priced forages and feed sources,]2] *income capitalization* of permit values, and [3] production analysis, such as using operations research techniques to model relationships based on budget data (Bartlett 1984). The third method is used to determine how much a forage grazing base contributes to the operation, thus is a *contributory value.* Thus three approaches are used in appraisals to value the lease: *comparable sales*, *contributory value* and *income capitalization.* These three basic approaches could be all variously used in determining the rental value of grazing lands (Souder and Fairfax 1996). The U.S. Forest Service (**Appendix F**) recommends *comparable sales* and *income capitalization* approaches, and also includes a *replacement cost* approach that is somewhat like the *contributory value* approach. Further explanation of these methods follows.

Comparable Sales. The comparable sales approach is frequently used in developing grazing fee formulas as well as agricultural land leases (Souder and Fairfax 1996). Theoretically, it takes the fees

paid to private landowners, adjusts the value according to differences in the services provided by the landlord, and arrives at a value representing the equivalent public fee, which is presumably a fair market fee. In this way, it does not differ conceptually from the appraisal process that would be conducted for residential real estate: comparable sales prices are adjusted according to differences in the properties to arrive at the appraised value. This comparable sales procedure is the basis for the Public Rangeland Improvement Act (PRIA) grazing fee formula, which is used for federal lands (see **Part 5.1.3.**). Souder and Fairfax (1996) examine how the comparable sales approach is used by the various states in setting their leasing fees (see **Part 5.1.3.**). The major limitation of using the comparable sales is finding private leases that are comparable to public lands and making appropriate adjustments for lease differences that exist (Bartlett et al. 2001).

Contributory Value. The second approach to appraisal of fair market value for leases is the contributory value method (Souder and Fairfax 1996). The appraisal considers the value of one input used in the production of the commodity. In the case of state endowment rangelands, according to Souder and Fairfax (1996), the input is the land and, sometimes, some or all of the infrastructure in the form of improvements. The value of this contribution then becomes the rent due from the lessee to the state. In agriculture, this contribution is often based on the percentage of the value that the land provides, versus the value that the labor and inputs of the lessee account for, which leads to a sharecropping system. Equally frequently, the contribution of the land in the form of forage, water access, and water availability is used as the basis for setting fees in grazing leases. Both of these contributory approaches are discussed by Souder and Fairfax (1996) in a section on fee arrangements in their book on *State Trust Lands*. They recommend a variation called the *cattle price share* approach, described herein at the end of **Part 5.1.3**. At one time Idaho used such a system, but no longer does. This approach works well if the relationship between cattle prices and the grazing fee is established appropriately (Hamilton, review comments).

Contributory value can also be determined by considering the cost of replacing an item in the production of a given commodity (Souder and Fairfax 1996). In some respects this is similar to the *comparable sales* approach, but the difference here is that the replacement often takes the form of a different commodity. Farm and ranch budgets are frequently constructed to determine operational costs. Mathematical programming methods are then applied to model the effect of changing these costs for lease fees to obtain the optimal fee level, which is the fee just short of where a replacement would be purchased, while still keeping the lessee in business. For grazing, the costs of replacing range forage are usually determined by the price of alternative grazing leases or the cost of hay and feed grain. Replacement costs for crop leases can represent an intensification cost of fertilizer or irrigation water to achieve the same results with less land. The replacement cost approach is frequently used for farm-level decision analysis, and it was used in the 1986 federal grazing fee study commissioned by the Bureau of Land Management (BLM) and the U.S. Forest Service (Souder and Fairfax 1996).

Income Capitalization. The third approach to valuing cropland and grazing leases is based on the capitalized value of the income they generate (Souder and Fairfax 1996). The value of the land is the present value of cash flows over a period of years discounted at a stated interest rate, and the annual equivalent of the capital value is the rental rate. This approach explicitly acknowledges that the lands should return some percentage of their value every year.

5.1.3. Grazing Fees

State trust land grazing fees are influenced by federal fees (Souder and Fairfax 1996). Because public sector grazing fees are generally acknowledged to be lower than private market rates, it is useful to begin with analysis of federal fee determination, compare federal fees to private fees, and discuss the interdependence of the public and private sectors. Then an analysis of state trust land grazing fee policies is more meaningful.

Federal Grazing Fees. The appropriate grazing fee for federal lands has been debated for decades (Gorte 1998). The U.S. Congress has mandated two sometimes contrary criteria—fair market value and equity—for setting the federal grazing fee. In the Federal Land Policy and Management Act (FLPMA) of 1976, Congress declared that the federal government should receive fair market value for the use of federal lands and their resources, "unless otherwise provided by statute" (43 U.S. Code § 35-1701(a)(9)). Later in the same statute,

Congress directed the secretaries of Interior and Agriculture to conduct a study of the value of grazing land with "a view to establishing a fee to be charged for domestic livestock grazing on such lands which is *equitable* to the United States and to the holders of grazing permits and leases on such lands" (43 U.S. Code § 35-1751(a), emphasis added). In the Public Rangelands Improvement Act (PRIA) of 1978, Congress reaffirmed a national policy to "charge a fee for public grazing use which is *equitable*" (43 U.S. Code § 37-1901(b)(3), emphasis added) and established the current grazing fee formula and declared that it represented "the economic value of the use of the land to the user" and "fair market value" (43 U.S. Code § 37-1905).

Historically, the fee for grazing forage on federal lands has been below the value of the range forage (Bartlett 1984). This difference and the difference between the federal government's costs and revenues of providing grazing have been sources of contention over grazing fees. If all costs of grazing accrued as revenue to the government, the grazing fee policy probably would have limited political controversy (Quigley et al. 1988).

The problem of pricing federal resources arises not from government ownership, but from the process that has emerged whereby the federal government sets prices (Quigley et al. 1988). The sometimes conflicting goals of economic efficiency and social equity are also problematic. The stages in the pricing process have tended to be [1] study, [2] fee proposal or implementation, [3] lawsuit, [4] congressional hearings, and finally [5] a compromise fee (Quigley et al. 1988). This process not only forces the federal government and resource users away from the economic self-examination of individual costs and returns and into the arena of politics, but also perpetuates the issues in a cyclical process driven by politics. Political pricing is not necessarily preferable to market pricing on purely economic grounds, because the choice of political over market approaches may reflect society's preference of equity over efficiency (Quigley et al. 1988).

A brief review of the recent history of the policy whereby federal grazing fees are determined follows. In the Public Rangelands Improvement Act (PRIA) of 1978, Congress established the grazing fee formula for federal lands. The PRIA formula for determining the grazing fee per AUM is:

$$\text{Fee} = \$1.23 \times ((\text{FVI} + \text{BCPI} - \text{PPI}) / 100)$$

where:

\$1.23 is the base forage value,
FVI is an index of prices for using private lands,
BCPI is the beef cattle price index, and
PPI is the prices paid index for the cost of beef cattle production (Godfrey 2001).

The \$1.23 base forage value was established by the 1966 Western Livestock Grazing Survey. It is the difference between total fee and non-fee costs of using federal and non-federal lands. The BCPI and PPI are sometimes called the "ability-to-pay" factors and were added to account for short-term market fluctuations; however, they have not (Torell et al. 2001a). What was to have been a seven-year trial period for the PRIA fee formula was extended indefinitely by Executive Order in 1986. The Executive Order also set the minimum grazing fee at \$1.35 per AUM (Torell et al. 2001a).

The PRIA also directed that a study of the federal grazing fee system take place. The original study was released in 1986. In 1991, Congress directed the U.S. Forest Service and the BLM to update the 1986 grazing fee study (P.L. 102-154) (Cody 1996). Although the 1992 update did not make recommendations to Congress regarding changes to the fee or fee formula, it provided new information by updating the appraised fair market value of grazing on federal rangelands, presenting the current costs of range management programs, and calculating a way to update the PRIA base forage value through the application of economic indices (Cody 1996). However, the \$1.23 base forage value in the formula has not been updated since the inception of the PRIA formula in 1979.

In the early- and mid-1990s, several attempts to change the grazing fee formula on federal lands either administratively or through a change in statutes failed. The formula remains the same as it has been since 1979. Fees have remained at less than \$2 per AUM since the early 1980s and at the minimum value of \$1.35 per AUM since 1996.

Private Grazing. The U.S. Department of Agriculture's National Agricultural Statistics Service (USDA-NASS 2001a) reports that average grazing fee rates for Idaho on private, non-irrigated grazing land for 2000 were \$10.90 per AUM. Private grazing leases, however, often include services not provided by federal or state land leases. Range economists (Bartlett et al. 2001) have reviewed numerous

studies comparing public and private grazing fees and determined that NASS private lease rates should be adjusted downward by 30% to account for services provided to lessors of private forage that are not provided on public lands, but this percentage is highly variable. Furthermore, the comparison to private land lease rates does not recognize the higher non-fee grazing costs shown to exist on public lands (Bartlett et al. 2001). The reliability of the NASS survey process also has been questioned (Brokken and McCarl 1987, Torell et al. 2001a).

Market Interdependence. The concept of market interdependence is an attempt by economists to describe the influence that quantity allocations and pricing decisions in the public sector have on observed quantity and price in private markets (Collins and Obermiller 1992). The existence of market interdependence violates an implicit assumption of minimal market influence when comparable private market prices are used to appraise resource value in public markets. Under interdependence, the *comparable sales* market approach becomes inappropriate for determining a fair market value in public resource markets because government actions have the potential to affect observed prices in private markets (Collins and Obermiller 1992).

"Various lease rate comparison studies support adjusting published private lease rates [$10.90 in Idaho] downward by a factor of about 30% to account for services accorded to lessors of private forage that are not provided on public lands."

– Valuing public land forage, by E.T. Bartlett, L.A. Torrell, N.R. Rimbey, L.W. Van Tassell, and D.W. McCollum, *Journal of Range Management* (2001, in press).

Given the existence of public/private forage market interdependence, there is an alternative valuation technique for public rangeland forage whose assumptions are not violated by market interdependence (Collins and Obermiller 1992). It is an *income capitalization* approach based on owner-operator earnings, as suggested by resource economists (Bartlett 1984) and in the U.S. Forest Service appraisal manual (**Appendix F**). A ranch operation budget is used to determine net returns to grazing permitees. By using this technique, only data from federal forage markets are employed to value forage, thereby eliminating use of private forage market data (Collins and Obermiller 1992). This technique has been used in Idaho's Owyhee County to estimate economic impacts of policy changes (see **Part 5.5.** from Rimbey et al. 1999, 2001).

State Trust Land Grazing Fees. The grazing fees charged by states are consistently higher than those charged for grazing on federal rangelands (Baldwin and Cody 1996). The BLM charged $1.35 per AUM from 1996-2000; the State of Idaho charged somewhere between $4.16 and $4.88 during the same period (IDL 2000b). In some areas state and federal rangeland quality is comparable; however, in others it is not (Baldwin and Cody 1996).

Grazing fees and the means of calculating them vary widely from state to state and sometimes even within a state; i.e., in different regions or agencies (Baldwin and Cody 1996). Some states solicit public bids at auction; some states derive the grazing fee through use of a formula; and some states may combine a bidding system for allocating leases, yet also charge additional fees such as rental fees or AUM charges. Some state formulas are patterned after the formula in the Public Rangeland Improvement Act (PRIA); some others differ. Most state formulas rely on some combination of forage value and other livestock market factors such as beef prices, costs of production, or livestock income (Baldwin and Cody 1996).

Idaho uses a grazing fee formula adopted by the Land Board in 1993 (IDL 2000b). The formula predicts an Idaho forage value index (IDFVI) for a given year based on four indices from two years previous. The IDFVI is then divided by 100 and multiplied by a base value, which has been set at $1.70 since 1993. The Land Board determined $1.70 per AUM to be fair market value for state grazing land in the 1964-1968 base period (Rimbey, review comments). The IDFVI formula for determing the Idaho state grazing fee per AUM is:

$$IDFVI_{t+2} = -6.92 + (0.13 \times FVI_t) + (0.60 \times CPI_t) - (0.33 \times PPI_t) + (0.74 \times IDFVI_t)$$

where:

$IDFVI_{t+2}$ is the predicted value of the Idaho Forage Value Index for the year the fee is to be set, i.e., two years hence;

FVI_t is the most recent published Forage Value Index for the 11 western states;
$BCPI_t$ is the most recent published Beef Cattle Price Index for the 11 western states;
PPI_t is the most recent published Prices Paid Index for the 11 western states; and
$IDFVI_t$ is the most recent published value for the Idaho Forage Value Index.

In 2001, the IDFVI was 291.31 so the grazing fee was $4.95 per AUM (291.31/100 × $1.70 base value). The sheep AUM rate is 75% of the AUM rate for cattle if the average lamb price is 70% or less of the price of calves during the same period. Since 1996, cattle and sheep grazing fees have not differed.

The problems with states' use of index formulas to obtain fair market value are similar to those identified in criticisms of the federal PRIA formula (Souder and Fairfax 1996, Torell et al. 2001a). First, there is controversy over whether the base value established in previous years is accurate. Second, when a fee is based on several composite price indexes that tend to vary together, changes in the fee tend to be exaggerated because some factors are double- or triple-counted. Moreover, the data included in the composites are not always relevant to the range livestock industry (Souder and Fairfax 1996).

In Idaho, the current state grazing fee formula sets the fee at least $1.00 per AUM below what seems to have been the Land Board's intent when it set the formula (Hamilton, review comments). The Land Board intended that the formula accurately predict the average Idaho private grazing land lease rate two years from the last data year and that the state grazing fee be one-half the predicted private grazing lease rate. Unfortunately, the formula is not particularly accurate, probably due to an overemphasis on the prices paid index, and it tends to perpetuate past errors in predicting the private land lease rate (Hamilton, review comments).

States' grazing fee determination procedures are discussed in general terms by Souder and Fairfax (1996) using the different valuation approaches. Additional information on how grazing fees are determined is provided by Souder and Fairfax (1996) in an appendix, including state-by-state specific grazing fee formulas. The same three appraisal approaches—*comparable sales*, *contributory value*, and *income capitalization*—can be used to characterize the grazing fee systems the states use (Souder and Fairfax 1996). The *contributory value* approach can be further subdivided into (a) PRIA-based formulations that use indexes to adjust fees (such as is used in Idaho), and (b) revenue divisions similar to sharecropping, called *cattle price shares*. This latter approach is different than price- and cost-indexed approaches to determining the *contributory value* of the state's land in the production of cattle (Souder and Fairfax 1996).

The *cattle price share* approach explicitly divides the value of the commodity produced between the state and the lessee, based on the conversion of forage to beef (Souder and Fairfax 1996). An AUM represents the amount of forage needed to support a mature cow for one month. Because the cow is either putting on or maintaining its weight by eating this forage, the gain resulting from the state's forage can be estimated. The value of the weight gain is then determined by the price of beef. However, forage is not the only input required in producing beef, so the rancher's contribution to the forage gain is also factored into the split between the state and the lessee. The essence of the *cattle price share* approach involves assigning equitable shares based on the relative contributions of the two parties (Souder and Fairfax 1996).

The *cattle price share* approach has the intuitive appeal of sharecropping in general: the production of commodities is a partnership between the landowner and the tenant, and each shares in the risks and rewards of the enterprise (Souder and Fairfax 1996). There appears to be considerable room for discussion between the states and the lessees over the proportion that each should receive, but at least with this method the calculation and the division are explicit. The ranchers may not know with certainty what the grazing fee will be in the future, but they at least know what part of the end value of the product is theirs and what part of it they must pay the state. The state also is relieved of uncertainty because the price used in the share approach is directly related to the value of the product, whereas price-indexed methods such as the modified PRIA formula used in Idaho are unpredictable in many ways (Souder and Fairfax 1996).

5.2. Target Rate of Return

A crucial factor in any financial or economic analysis of proposed range improvements (private or public) is the interest rate to be used for either the discounting calculations underlying the determination of present values or comparison of the rate of return generated by the project with alternative investments (Workman 1986). As mentioned in **Part 3.3.4**, the ideally "correct" interest rate used to discount for time combines the individual rates for the real (inflation-free) opportunity cost and risk. The social discount rate for financial analysis on public lands is also an important consideration (Workman 1986). There is no actual "correct" interest rate. The choice of a rate is a policy decision, affected by how policymakers value the returns to the trust in relation to the present status quo choice of projects and by what standards of performance they want land managers to consider as they serve their trust responsibilities.

Ideally, the interest rate used for discounting should be the higher of either the interest rate that the investor must pay for borrowed capital or the opportunity cost rate; i.e., the rate of interest that could be earned if the capital required for the range investment were instead invested in its highest yielding alternative use (Workman 1986). The best alternative use of range investment capital is not always known. For this reason, and in an attempt to provide more widely applicable management recommendations from range economics research, a representative borrowing rate is often used as the interest rate for discounting purposes. Since the expected returns are measured in real (non-inflated) prices, the appropriate borrowing or opportunity cost rate is a real rate of interest (Workman 1986).

To establish the value of grazing land, ranch appraisers often calculate a market capitalization rate, based on recent ranch sales, by dividing net return to land and buildings by sale price (Workman 1986). Such calculated rates are usually only 2% to 3%, compared with risk-free real borrowing and real opportunity cost rates of around 4%. This discrepancy sometimes causes observers to wonder why ranch prices are so high and why they increase in the face of such low net returns (Workman 1986). This question is partially addressed in **Part 5.5**. Quality-of-life factors are the explanation.

5.3. Valuation Approaches

This part of the report analyzes alternative methods or approaches for estimating the value of grazing lands. Valuation of private rangelands that are subject to market sales from time to time is difficult because the public grazing leases are capitalized into ranch values, as are anticipated increases in land values. According to the literature reviewed (see **Part 5.5**), net annual income seems less important to many ranchers than quality-of-life factors. Nevertheless, appraisals are made for the purposes of determining annual property taxes, loan collateral value, and as a guide to value when the ranch is sold.

This section looks first at the potential of the taxable value of private rangeland for use in financial performance evaluation. Then we consider the *income capitalization* approach, especially the land expectation value.

5.3.1. Taxable Value of Private Grazing Lands in Idaho

The relevant question is not determining the *taxable* value of endowment rangelands, because the state does not pay property taxes, but rather determining the *fair market value* of endowment rangelands, in order to develop a grazing lease system that maximizes financial returns for the public schools and other beneficiaries of the endowment trust lands. To the extent that endowment rangeland assets are comparable to private rangelands in Idaho, the value of private grazing lands as determined for property tax purposes might provide a viable approach toward estimating the value of endowment grazing lands.

Rangeland is called "Dry Grazing Land" (Category 5) for property tax purposes in Idaho. Dry grazing land is capable of supporting grasses but not normally capable of supporting crops (IDAPA 2001b). For property tax purposes, land that is used by the owner for the grazing of livestock, or is leased to a lessee for grazing purposes, is eligible for appraisal, assessment, and taxation as agricultural property (Idaho Code § 63-604).

The "speculative portion" of the value of agricultural land is exempt from taxation (Idaho Code § 63-602K). The speculative portion is the difference between the current market value and the taxable value of agricultural land. Current market value is established from market sales of similar land. The taxable value of agricultural land is determined by capitalizing net income per acre (IDAPA 2001b).

Valuing endowment grazing lands based on the capitalized net income may have problems similar to using the forest land productivity formula for similar purposes, as discussed in **Part 4.4.3**. For example, is the revenue and expense pattern realistic? If realistic means fair market value, then endowment grazing revenue is not realistic because it is administratively determined using a complex formula that does not accomplish what it was designed to do (**Part 5.1.3**).

There may be additional problems with this approach, summarized as follows. Agricultural lands in Wyoming, as well as in most western states, are taxed on the basis of their productivity (Spahr and Sunderman 1998). However, previous research suggests that farm and ranch market values are based on numerous factors, of which productivity is only one. Taxing agricultural land based on productivity may be reasonable if the highest and best use of the land is agricultural and the property is being used for that purpose. However, taxing agricultural land on the basis of productivity seems questionable when the market value far exceeds its productive value (Spahr and Sunderman 1998).

5.3.2. Income Capitalization

The Idaho Department of Lands produced a "2000 Asset Valuation Report" for the Land Board, providing general information about the 2,462,621 acres of land in the state Endowment Trusts (IDL 2000a). Part of the report included an estimate of the total value of these lands at $825,535,000 which was determined by applying a capitalization rate of 6.5% to the average annual net income for all land uses of $53,659,659 for the years 1992 to 1999. The capitalization rate was "derived from the market and conversations with appraisers and owners of large properties ... and reflects the fact that the Endowment Trusts do not pay income or property taxes" (IDL 2000a).

The "2000 Asset Valuation Report" (IDL 2000a) contained much useful information about the different land classifications, but made no attempt to appraise them individually. This estimate included forest lands as well as grazing lands, and is an inaccurate appraisal because it is based on current levels of income that do not always reflect the fair market value of the lands, as an appraisal generally does. Financial performance evaluation depends on a more precise appraisal of land value by which to base judgments on asset management performance.

Endowment lands include more than 1.8 million acres leased for forage and provide as many as 267,700 AUMs. Annual average grazing lease income amounted to $1,276,900 for the period 1992 to 2000; during that time, annual management and administration costs averaged $852,900 (IDL 2001b). Average annual net income from grazing leases was $424,000, which translates to $1.53 per AUM or 23 cents per acre of leased rangelands.

If grazing lease payments were related to land value, then the average annual net income from grazing could be capitalized to estimate the fair market value of grazing lands. However, the capitalized value of 23 cents per acre at any rate provides a poor benchmark for asset value by which to gauge financial performance. A fair market value of this asset class is needed in order to establish a defensible basis for judging financial performance.

To demonstrate credibly that endowment rangelands are being managed to provide the "maximum long term financial return" to the beneficiaries, the appraisal task needs to be done, for the same reasons it needs to be done for forest land. The change in land value from one year to the next is part of the rate of return on the value of the asset that cannot be ignored. In his *Range Economics* textbook, Workman (1986) says land value appreciation is at least as important as net ranch income.

Determining the fair market value of 1.8 million acres of rangeland is a daunting appraisal task using a *comparable sales* approach. Nevertheless that may be the best method. The question is whether there are an adequate number of sales of private rangelands with which to compare the endowment rangelands. If the *comparable sales* method is impractical, then other valuation approaches must be considered. The *contributory value* approach, especially the *cattle price share* method described above, is recommended by some (e.g., Souder and Fairfax 1996).

The *income capitalization* appraisal method is recommended by the U.S. Forest Service (**Appendix F**). Net income could be based on owner-operator earnings analysis. Rangelands could be classified into typical units based on geography and/or land productivity, and ranch budgets based on costs and returns for different ranches in these classifications could be developed to reflect how changes in grazing fees would affect ranch management performance (see Rimbey et al. 1999, 2001).

The low net income currently obtained from endowment rangelands ($0.17 per acre in 2000) leads

to an extremely low asset value of $4.36 per acre. The literature reviewed herein offers rationalizations for higher grazing fees that can be used to develop proximate values for forage on endowment rangelands. A scenario for increasing current Department of Lands grazing fees of less than $5 per AUM to more than $7 per AUM is developed for the purpose of estimating the fair market value of forage on endowment rangelands using a hypothetical net income, from which the land expectation value (LEV) can be calculated and used as the basis for determining return on assets (ROA) from grazing.

5.3.3. Land Expectation Value

The logic underlying the land expectation value is that market-determined private rangeland lease rates in Idaho ($10.90 in 2000) are roughly double the state's lease rate, which is administratively determined. Private leases provide services that state leases do not, with a factor of about 30% needed to adjust for the difference (Bartlett et al. 2001). A state fair market value grazing fee is therefore approximately $7.63 in 2000, which is more than a 50% increase in the actual fee of $4.75. With this hypothetical grazing lease fee, less Department of Lands costs, the result would be net income of $1,035,764. Capitalized at 4% this hypothetical net income results in a land expectation value of $25,894,100. This is approximately $14.45 per acre, which represents forage value for endowment grazing lands, or 70% of the capitalized value of leased forage on private lands.

A scenario for increasing current Department of Lands grazing fees of less than $5 per AUM to more than $7 per AUM is developed for the purpose of the estimating the fair market value of endowment rangelands using a hypothetical net income, from which the land expectation value (LEV) can be calculated and used as the basis for return on assets (ROA).

5.4. Return on Assets (ROA) Estimate for 2000

The actual grazing lease net income in 2000 was $320,600 (Table 5-1, line c). This realized income provided a return on asset value of 1.3% (Table 5-1, line m). The appreciation in land asset value provided an unrealized return on land asset of 1.1%. The total return on assets in 2000 was therefore 2.4%; in 1998 it was 7.0%, and in 1999 it was –6.4% (Table 5-1, line o). The changes in land value influenced the total return on assets more than did the return on grazing income, which was 1.1% in 1998 and 0.9% in 2000 (Table 5-1, line m). The fluctuation in land expectation value is due to changes in Department of Lands net income, a function of cash income and expenditures (Table 5-1, lines a to c). Are the land value changes realistic? If a study in New Mexico is applicable to the Idaho situation, then it is likely that an annual 2.1% real appreciation in land value is occurring (Torell and Bailey 2000). This may be a modest estimate, as pasture land value in Idaho increased 7.3% per year from 1997-2001 and non-irrigated cropland value increased 4.6% per year during the same period (USDA-NASS 2001b). In this analysis, we are only attempting to use forage value for performance evaluation because that is what private ranchers lease from the state.

Table 5-1. Total return on assets: grazing and land (ROA_{G+L}), using a 4% discount rate to calculate land expectation value (LEV), Idaho endowment rangelands, FY 1998-2000.

	Fiscal Year$_t$		
	FY 1998	**FY 1999**	**FY 2000**
Net Income Calculation			
(a) Cash income from rangeland management[1]	$1,168,100	$1,283,800	$1,306,900
(b) Cash expenditures for rangeland management[1]	$885,900	$1,046,700	$986,300
(c) Net income from rangeland[1]	$282,200	$237,100	$320,600
Land Expectation Value (LEV) Calculation (@ 4%)			
(d) Idaho private land grazing fee, per AUM[2]	$10.80	$11.10	$10.90
(e) Adjustment factor, private land to public land grazing fee[3]	0.3	0.3	0.3
(f) Fair market value Idaho endowment land grazing fee[4]	$7.56	$7.77	$7.63
(g) Total animal unit months (AUMs), endowment lands[5]	263,279	266,513	265,015
(h) Attainable annual grazing lease income at FMV fee[6]	$1,990,389	$2,070,806	$2,022,064
(i) Cash expenditures for rangeland management[1]	$885,900	$1,046,700	$986,300
(j) Attainable annual net income from grazing[7]	$1,104,489	$1,024,106	$1,035,764
(k) Land expectation value (LEV) @ 4%[8]	$27,612,231	$25,602,650	$25,894,111
(l) LEV change from previous year (i.e., $_{t-1}$ to $_t$)[9]	$1,533,229	($2,009,581)	$291,461
Total Return on Assets: Grazing and Land (ROA_{G+L})			
(m) Return on assets: grazing income (ROA_G)[10]	1.1%	0.9%	1.3%
(n) Return on assets: land value change (ROA_L)[11]	5.9%	-7.3%	1.1%
(o) Total return on assets: grazing and land (ROA_{G+L})[12]	7.0%	-6.4%	2.4%

Footnotes on source data and calculation methods:

[1] Source: "Total by Asset Type, Statement of Cash Flow, FY 1992 - FY 2000" (IDL 2001b).

[2] Source: "Grazing fee rates for cattle by selected states" (USDA-NASS 2001a).

[3] According to range economists, "Various lease rate comparison studies support adjusting published private lease rates downward in each state by a factor of about 30% to account for services accorded to lessors of private forage that are not provided on public lands" (Bartlett et al. 2001).

[4] (d) x (e)

[5] Source: Idaho Department of Lands (IDL 2001f).

[6] (f) x (g)

[7] (h) - (i)

[8] (j) / .04

[9] $LEV_t - LEV_{t-1}$

[10] $(c)_t / LEV_{t-1}$

[11] $(l)_t / LEV_{t-1}$

[12] (m) + (n)

Sensitivity Analysis: Discount Rate. Economists use a process called sensitivity analysis to understand how a change in the value of a variable will affect a performance measure. We tested the sensitivity of the return on assets calculation to the target rate used to discount future cash flows for calculating a land expectation value (LEV). As the target rate was increased from 3% to 7%, the rate of return from rangeland grazing lease net income (ROA_G) in FY 2000 increased from 1.0% to 2.2% (Table 5-2). Each additional 1% added to the target rate resulted in approximately 0.3% added to thegrazing lease income portion of return on assets (ROA_G), regardless of the year. The land value change portion of return on assets (ROA_L) was unaffected by the choice of a target rate (Table 5-2).

It is clear that the higher the target interest rate, the higher the return on rangeland assets will be (Table 5-2). This happens only because the higher target rate results in lower land expectation values.

Table 5-2. Sensitivity analysis: effect of discount rates from 3% to 7% on land expectation value (LEV) and total return on assets (ROA_{G+L}), Idaho endowment rangelands, FY 1998-2000.

	Fiscal Year$_t$		
	FY 1998	**FY 1999**	**FY 2000**
Land Expectation Value (LEV) Calculation			
Attainable net income at fair market value grazing fee*	$1,104,489	$1,024,106	$1,035,764
Land expectation value (LEV) @ 3%	$36,816,308	$34,136,867	$34,525,467
Land expectation value (LEV) @ 4%*	$27,612,231	$25,602,650	$25,894,100
Land expectation value (LEV) @ 5%	$22,089,785	$20,482,120	$20,715,280
Land expectation value (LEV) @ 6%	$18,408,154	$17,068,433	$17.262,733
Land expectation value (LEV) @ 7%	$15,778,418	$14,630,086	$14,796,629
Total Return on Assets: Grazing and Land (ROA_{G+L})			
Net income from rangeland forage grazing leases*	$282,200	$237,100	$320,600
Return on assets: grazing income (ROA_G) @ 3%	0.8%	0.6%	1.0%
Return on assets: grazing income (ROA_G) @ 4%*	1.1%	0.9%	1.3%
Return on assets: grazing income (ROA_G) @ 5%	1.4%	1.1%	1.6%
Return on assets: grazing income (ROA_G) @ 6%	1.6%	1.3%	1.9%
Return on assets: grazing income (ROA_G) @ 7%	1.9%	1.5%	2.2%
Land expectation value (LEV) change ($_{t-1}$ to $_t$) @ 3%	$2,044,305	($2,679,441)	$388,615
Land expectation value (LEV) change ($_{t-1}$ to $_t$) @ 4%*	$1,533,229	($2,009,581)	$291,461
Land expectation value (LEV) change ($_{t-1}$ to $_t$) @ 5%	$1,226,583	($1,607,665)	$233,169
Land expectation value (LEV) change ($_{t-1}$ to $_t$) @ 6%	$1,022,153	($1,339,721)	$194,307
Land expectation value (LEV) change ($_{t-1}$ to $_t$) @ 7%	$876,131	($1,148,332)	$166,549
Return on assets: land value change (ROA_L) @ 3%	5.9%	-7.3%	1.1%
Return on assets: land value change (ROA_L) @ 4%*	5.9%	-7.3%	1.1%
Return on assets: land value change (ROA_L) @ 5%	5.9%	-7.3%	1.1%
Return on assets: land value change (ROA_L) @ 6%	5.9%	-7.3%	1.1%
Return on assets: land value change (ROA_L) @ 7%	5.9%	-7.3%	1.1%
Total return on assets: grazing and land (ROA_{G+L}) @ 3%	6.7%	-6.6%	2.1%
Total return on assets: grazing and land (ROA_{G+L}) @ 4%*	7.0%	-6.4%	2.4%
Total return on assets: grazing and land (ROA_{G+L}) @ 5%	7.2%	-6.2%	2.7%
Total return on assets: grazing and land (ROA_{G+L}) @ 6%	7.5%	-6.0%	3.0%
Total return on assets: grazing and land (ROA_{G+L}) @ 7%	7.8%	-5.8%	3.3%

* Indicates data presented or developed in Table 5-1.

Sensitivity Analysis: Grazing Fee. Sensitivity analysis illustrates the effect of grazing fees on ROA (Table 5-3). To build on the analysis of different interest rates in Table 5-2, we calculate net income and land expectation value using 1992-2000 annual averages for endowment grazing AUMs and IDL costs of rangeland management (Table 5-3, lines d to k). By holding the grazing fee and management costs constant over a nine-year time period, there will be no increase in land expectation value as a result of grazing income, so the return on asset value (ROA_G) is provided only from grazing lease net income, demonstrating the effect of grazing fees independent of other factors.

Table 5-3. Sensitivity analysis: effect of grazing fee and interest rate variations on land expectation value (LEV) on a $/AUM basis, and return on asset value from grazing net income (ROA_G).

	Grazing Fee Variations					
	(A) Federal lands	(B) Idaho state lands	(C) Hypo-thetical	(D) Fair market value	(E) Hypo-thetical	(F) Idaho private lands
Net Income Calculation: 2000 Actual Values ($/AUM)						
(a) Grazing fee	$1.35	$4.75	$6.00	$7.63*	$9.00	$10.90*
(b) IDL cash expenditures ($/AUM)	$3.72#	$3.72#	$3.72#	$3.72#	$3.72#	$3.72#
(c) Net income from grazing ($/AUM)	($2.37)	$1.03	$2.28	$3.91#	$5.28	$7.18
Net Income Calculation: 1992-2000 Average Values ($/AUM)						
(d) Grazing fee	$1.35	$4.75£	$6.00	$7.15	$9.00	$10.22
(e) IDL cash expenditures ($/AUM)	$3.31	$3.31	$3.31	$3.31	$3.31	$3.31
(f) Net income from grazing ($/AUM)	($1.96)	$1.44	$2.69	$3.84	$5.69	$6.91
Land Expectation Value (LEV) Calculation: 1992-2000 Net Income Average Values ($/AUM)						
(g) LEV @ 3% discount interest rate	($65.33)	$48.00	$89.67	$128.00	$189.67	$230.33
(h) LEV @ 4% discount interest rate	($49.00)	$36.00	$67.25	$96.00	$142.25	$172.75
(i) LEV @ 5% discount interest rate	($39.20)	$28.80	$53.80	$76.80	$113.80	$138.20
(j) LEV @ 6% discount interest rate	($32.67)	$24.00	$44.83	$64.00	$94.83	$115.17
(k) LEV @ 7% discount interest rate	($28.00)	$20.57	$38.43	$54.86	$81.29	$98.71
Return on Assets (ROA) Calculation: 2000 Grazing Net Income / Fair Market Value LEV (column D)						
(l) ROA with LEV @ 3% interest rate	-1.9%	0.8%	1.8%	3.1%	4.1%	5.6%
(m) ROA with LEV @ 4% interest rate	-2.5%	1.1%	2.4%	4.1%	5.5%	7.5%
(n) ROA with LEV @ 5% interest rate	-3.1%	1.3%	3.0%	5.1%	6.9%	9.3%
(o) ROA with LEV @ 6% interest rate	-3.7%	1.6%	3.6%	6.1%	8.3%	11.2%
(p) ROA with LEV @ 7% interest rate	-4.3%	1.9%	4.2%	7.1%	9.6%	13.1%
Return on Assets (ROA) Calculation: 2000 Grazing Net Income / Variable LEVs (An inappropriate method used only for illustrative purposes)						
(q) ROA with LEV @ 3% interest rate	3.6%	2.1%	2.5%	3.1%	2.8%	3.1%
(r) ROA with LEV @ 4% interest rate	4.8%	2.9%	3.4%	4.1%	3.7%	4.2%
(s) ROA with LEV @ 5% interest rate	6.0%	3.6%	4.2%	5.1%	4.6%	5.2%
(t) ROA with LEV @ 6% interest rate	7.3%	4.3%	5.1%	6.1%	5.6%	6.2%
(u) ROA with LEV @ 7% interest rate	8.5%	5.0%	5.9%	7.1%	6.5%	7.3%

* Indicates data presented or developed in Table 5-1.

# Indicates data preneted in Table 5-1, but not on a $/AUM basis as here.

£ It is a coincidence that the 1992-2000 average fee is the same as the 2000 actual fee.

This analysis was developed by using six variations on grazing fees (Table 5-3, columns labeled A to F). Fee (A) is the grazing fee on BLM and U.S. Forest Service lands. Fee variation (B) is the annual average fee on Idaho endowment lands from 1992-2000. Variations (C) and (E) are hypothetical fees used for illustrative purposes in this analysis. Variation (D) is the fair market value of state grazing fees determined by applying an adjustment factor to Idaho private grazing fees (Variation F), as was done in Table 5-1.

This sensitivity analysis demonstrates the intuitive result that the higher the grazing fee, the higher the ROA (Table 5-3, lines l to p). For example, the federal grazing fee (A) does not cover the costs of managing endowment rangelands, and the return on assets is negative regardless of the target rate (Table 5-3, column A, lines l to p). The average Idaho state grazing fee (B) provides a return on assets ranging from 1.0% to 2.3%, at target rates of 3% to 7%, respectively, as demonstrated in Table 5-2 and again in Table 5-3 (column B, lines l to p). As the grazing fee is increased (Table 5-3, columns C to F), the corresponding return on asset value also increase at any discount interest rate (Table 5-3, lines l to p).

A policy question of some importance is, what is a desirable return on asset value for state grazing leases? The analysis in Table 5-3 provides information that can be used to interpret different replies to the question. If, for example, a real rate of return of 6% from endowment land assets is an appropriate target, as the Citizens' Committee (2001) report recommended, it is not possible to attain that rate of return with grazing fees set below the fair market value estimate of $7.15. Similarly, if 4% is the desired target rate, a below fair market value grazing fee will not be able to attain the target. The reason is that because the fair market value grazing fee (D) is used to determine the land expectation value of grazing lease income, this fee level provides just enough net income to break even at the target rate (Table 5-3, column D, lines l to p). Only a fee set above that used to determine the LEV will earn more than the target rate (Table 5-3, columns E and F, lines l to p). This sensitivity analysis makes it clear that the future income stream used to determine the land expectation value, as well as the discount rate of interest, affects the ROA. The future income stream is a function of the grazing fee and management costs.

What if a different income stream other than the fair market grazing fee (D) is used to calculate the LEV? Sensitivity analysis (Table 5-3, lines q to u) indicates that if a low grazing fee is used to calculate the LEV, the ROA can produce nonsense results. For example, the federal grazing fee of $1.35 per AUM is below the IDL cash expenditure per AUM, resulting in negative net income from grazing (Table 5-3, column A, line f). The LEV is correspondingly negative. When negative net income is divided by a negative asset value, the result is nonsense: a positive rate of return on assets (Table 5-3, column A, lines q to u). Similarly, it does not make sense to evaluate the financial performance of endowment rangelands by using an administratively determined grazing fee barely above management costs to calculate the value of endowment rangelands for forage production, even though the Idaho State Lands grazing fee (Table 5-3, column B, lines q to u) produces a positive net income and an ROA that might seem to make sense.

5.5. Lessons from Research on Low Rates of Return

While developing information to reply to the focus questions that underpin the outline of this report, several research studies were reviewed that make pertinent but tangential points about income from grazing lands. Some of these ideas may be useful in understanding the way things are, and perhaps making improvements.

Profit maximization appears to be an inadequate model for explaining rancher behavior, which has implications for estimating what impacts modifications in public land policies might have, or for describing grazing land use and value. Reasons for this include historically low returns to livestock production, which is only a small part of rangeland value, and ranchers' desire for the lifestyle.

Why are rates of return low? Profit maximization appears to be an inadequate model for explaining rancher behavior, which has implications for estimating what impacts modifications in public land policies might have, or for describing grazing land use and value (Torell et al. 2001b, Bartlett et al. 2001). Reasons for this include historically low returns to livestock production, which is only a small part of rangeland value, and ranchers' desire for the lifestyle. Support for these findings follows.

First of all, livestock production returns have historically been and continue to be less than what could be made by investing in alternative investments of comparable risk (Torell and Bailey 2000, Bartlett et al. 2001). Second, only a small portion of rangeland value is explained by livestock production value (Bartlett et al. 2001). For example, research has shown that in the most productive rangeland areas of New Mexico, only 27% of the value of ranches could be explained by livestock production potential (Torell and Bailey 2000). Third, more than 30 years of research and observation has shown that for many ranchers, quality-of-life values are among the most important reasons for the purchase of western ranches (Torell and Bailey 2000, Bartlett et al. 2001). Ranch buyers want an investment they can touch, feel and enjoy, and they have historically been willing to accept low returns from the livestock operation.

Over 30 years ago, research on costs and returns in the western range cattle industry showed returns to capital and management ranging from very low to negative in all areas studied (Martin and Jeffries 1966). A review of various research studies from 1926-1968 reported real rates of return for western cattle from negative values to 6.5% (Agee 1972).

Low livestock returns have continued in more recent times (Torell and Bailey 2000). During the 1991-98 period, a study of 306 herds in Texas, Oklahoma, and New Mexico found that the average livestock production rate of return on the current market value of assets was 0.91%, with a considerable amount of variation. Ranches in the lowest quartile of net income realized an average rate of return of –6.0%, while those in the top quartile made an average return of 7.5%. In another study in New Mexico, livestock cost and return estimates were prepared annually over the 1986-97 period for three different ranch sizes in each of five ranching areas or regions of the state. Annual rangeland appreciation averaged 2.1%. This is in contrast to the 1982-86 period when the market value of New Mexico ranches fell by more than 50% (Torell and Bailey 2000).

All New Mexico ranches appear to be inflated in value relative to livestock production value (Torell and Bailey 2000). As would be expected with economies of scale, average annual livestock returns increase with ranch size. Large and extra-large ranches (300 to 500 cows) in eastern New Mexico had an average 2% to 3% annual nominal rate of return from livestock production, while medium size ranches (200 cows) made about 1% as a nominal livestock return on total ranch investment (including land, houses and buildings, equipment and cattle investments). Small ranches (< 100 cows) lost money on the investment over the 1986-97 period (Torell and Bailey 2000).

Policy Implications of Low Rates of Return. There are significant rangeland policy implications from having the market-driven value of western ranches greater than what the livestock justify (Torell and Bailey 2000; Torell et al. 2001b). More than 30 years ago Martin and Jeffries (1966) noted that Arizona ranchers had been willing to pay too much for ranches, grazing permits, and private grazing leases. They concluded that only a competitive bidding process would be able to accurately solicit the willingness to pay for forage. Other range economists agree (Torell and Bailey 2000, Torell et al. 2001a).

Based on returns from livestock and with inflated grazing permit investments, public land ranchers can justifiably argue that they are already paying too much to graze the public lands (Torell and Bailey 2000; Torell et al. 2001b). Livestock production value does not justify even the current gazing fee when permit investments are recognized. Yet, inflated permit values also demonstrate a willingness to pay even higher grazing fees if permit value is redirected to the land agencies (Torell and Bailey 2000; Torell et al. 2001b).

A competitive bid system is perhaps the only way to redirect permit value to the land agencies (Torell and Bailey 2000). There are obvious questions about whether the federal government is entitled to this permit value and whether current ranchers should be compensated for the value of the gazing permit if grazing fees are increased (Torell and Bailey 2000). The same types of questions need to be answered about the value of state leases and whether state lessees should be compensated.

How many people will be forced out of business if a certain land use policy is implemented? (Torell and Bailey 2000; Torell et al. 2001b). The standard procedure for developing a reply to this policy question has been to set a minimum rate of return or return level—i.e., a target rate—and use budgeting and economic modeling techniques to estimate whether net returns are likely fall below the target rate after policy implementation (Torell and Bailey 2000).

The limitation of this type of study is obvious. Based on any reasonable assumption about minimum acceptable investment returns, many ranchers

should not be in business even before a policy change (Torell and Bailey 2000). The implications for assessing the financial performance of state trust lands leased to ranchers for grazing purposes is equally obvious. Attempts to increase the grazing lease payment to anything resembling the fair market value of the forage are likely to meet strong opposition.

Quality-of-Life and Leasehold Values. The quality-of-life values inflating the ranch real estate market are the key to understanding the apparent disparity between the desirability of ranch life and low rates of return on cattle raising (Torell and Bailey 2000, Torell et al. 2001b, Bartlett et al. 2001). It is not possible to estimate how many ranchers will quit, go bankrupt, retire, or sell unless the wealth position of each impacted rancher is known. Furthermore, for predictive purposes it is necessary to know how committed the affected ranchers are to maintaining their lifestyle. For the most part, ranchers have demonstrated their willingness to accept below market rates on the ranch investment, and it is the unobservable level of satisfaction and utility obtained from being a rancher that may determine if a policy change will force people off their ranches (Torell and Bailey 2000). Contingent valuation has been suggested as a method to estimate these nonmarket, quality-of-life values (Bartlett et al. 2001).

There were, and continue to be, strong policy implications from ranch values that are inflated above the value of ranch use for livestock production (Torell and Bailey 2000; Torell et al. 2001b). Ranch investment and policy analysis requires a great deal more thought than is offered by traditional cost-and-return studies about the financial value of livestock production (Torell and Bailey 2000). Nevertheless, such studies are a logical starting point for considering policy changes for state trust lands.

The existence of permit, or leasehold, value is well documented (Bartlett et al. 2001). From a summary of 20 different studies that estimated federal rangeland permit values using various methods, values ranged from negative amounts to $300 per AUM (Stern 1998). Permit values occur without an apparent grazing cost advantage on public lands (Bartlett et al. 1993), and a major part of this value appears to occur for reasons unrelated to livestock production and profit potential. Implying that permit value is solely a capitalized value of excess livestock earning potential is not appropriate (Bartlett et al. 2001).

Economists used Farm Credit Services appraisal reports for 1982-1992 to estimate permit values (Bartlett et al. 1993). Values averaged $37 per AUM for BLM permits and $42 per AUM for Forest Service permits. Using the same data set, Idaho endowment land leasehold value was $25 per AUM (Rimbey, review comments). These estimates are the appraiser's allocation of value to the ranch property derived from federal and state land permits and leases (Rimbey, review comments). Hamilton (review comments) suggests leasehold values for Idaho state grazing land are about $50 per AUM, but vary considerably.

Policy Modeling of Range Livestock Cost and Returns. Ranchers may be directly and indirectly impacted by the decisions and policies of federal and state land agencies (Rimbey et al. 1999). Grazing policy can impact ranchers at least five ways:

1. The cost of grazing on public lands can increase. This is the obvious controversy about grazing fees and proposed grazing restrictions that would increase non-fee cost of public land use.
2. Policy restrictions can decrease the total number of Animal Unit Months (AUMs) of grazing that can be grazed on federal lands. With a "shortage" of public land AUMs, there may be a tendency to increase lease rates on private land grazing resources.
3. The seasonal availability of forage use allowed on public lands can change. Some allotments have traditionally been grazed by specific classes of livestock.
4. Changing the class of livestock is a way that land use policies affect public land ranchers.
5. Uncertainty created when the future direction of grazing fees and land-use policies is undefined for an extended period of time. This situation has prevailed at least since 1986 when debate about grazing fees was rekindled by new studies, followed by a continual stream of new grazing fee and land use policy proposals. Future public land management policies and the accessibility of public lands for grazing have become less certain as the controversy continues (Rimbey et al. 1999).

The common denominator for estimating the economic impacts of policy changes on public land

ranchers is the cost and return structure of those ranches (Rimbey et al. 1999). A budgeting approach using linear programming and other modeling techniques seems to be the most appropriate method for deriving demand for range livestock grazing (Bartlett 1984). Ranch-level cost and return estimates (enterprise budgets) form a logical first step in assessing the economic impacts of changes in natural resource policy. However, gathering and presenting this information in a consistent and useable fashion has been difficult (Rimbey et al. 1999).

Changes in public land livestock grazing (increases or decreases in AUMs of grazing) can easily be assessed at the ranch-level and included in regional, fiscal and social assessments, based upon the format outlined with the budget generator program (Rimbey et al. 1999). This approach has been used in the assessment of Owyhee County's economic and social structure (Darden et al. 2001). Policymakers need to know these impacts prior to changing public policy (Rimbey et al. 1999, 2001; Darden et al. 2001).

Regional Economic Impacts and Community Effects. The impacts of a grazing fee increase on ranch operations is a topic that has generated considerable research; however, many of these studies are directed at local or regional economic effects and differ in what they are trying to measure or address, making them difficult to use to assess the economic impacts westwide (Cody and Baldwin 1998). This is an aggregation problem not easily resolved at the federal level, but also has implications for state level policymakers.

The level of spatial and economic aggregation used to assess policy changes is a significant problem for impact assessment (Harp et al. 2000). It is not simply a methodological choice to use a state or county estimate, for example. The choice has implications for policy in that an impact may be very large for one county, but negligible for the state as a whole. Thus the policy discussion is framed by how the aggregation of estimated economic consequences of different policy choices is approached. Even county level analysis can mask significant differentiation between community-level economies and this differentiation has direct implications for evaluating the range cattle industry and federal grazing policies (Harp et al. 2000). For example, economic dependencies in rural communities, notably, dependencies on the range cattle industry, differ significantly between communities. In a study of seven Idaho communities in Custer and Lemhi counties, this differentiation between communities is completely masked when the two county area is examined as one economy (Harp et al. 2000).

5.6. Environmental and Social Considerations

Public land uses other than raising livestock have gained greater importance in policy proposals recently (Egan and Watts 1998). Under the current property rights regime, the market solution of trading grazing permits is restricted because political action is used to allocate public land use. The effect of increased political pressure to emphasize noncommercial uses on grazing permits values is estimable. If the rights to grazing permits were secure and transferable, then the grazing permits values would not decrease in value as noncommercial uses become more desired. However, research results indicate that as noncommercial uses of public lands become more dear, grazing permit values have declined (Egan and Watts 1998). This probably has occurred because noncommercial uses have led to restrictions that increase the costs of grazing, thus lowering permit value (McKetta, review comments).

Accounting for environmental and social considerations, which often involve nonmarket values, can be problematic. Numerous researchers have struggled with the problem of pricing non-market resources and products for more than 30 years (Workman 1986), but no method has proved to be completely satisfactory. Contingent valuation (CV) is one method that continues to be developed. Using CV to value goods has problems, such as the potential for biased responses and determining an appropriate payment vehicle. However, some range economists feel that given recent advances in the CV method, it is a valuable methodology in examining production and quality-of-life values associated with public land grazing. The CV method still requires additional refinement, application, and testing (Bartlett et al. 2001).

Another approach is to develop a set of performance indicators, including environmental and social criteria and indicators as well as financial (AIS 2000). Table 3-1, presented in **Part 3.6.3**, provides a format that could be modified to represent the relevant categories of criteria and indicators for all asset classes of Idaho endowment lands.

In range management, as well as natural resource management in general, some of the more

common and most difficult decision problems involve allocation of fixed land resources among competing uses (Workman 1986). How much of a particular tract of rangeland should be devoted to livestock grazing and how much should be set aside for big game habitat? What proportion of a high country area should be open for recreational activities and what proportion should remain closed to protect important watersheds? Questions like these usually require political decisions that are not necessarily based on financial criteria. However, in any land use decision for which the alternative products have established market prices (as do livestock forage, timber, drinking and irrigation water as well as some recreational pursuits), joint production economics principles can be used to determine the optimum allocation to maximize combined net return to the fixed land resource. Even for those natural resource products that we all agree are crucial (such as watershed protection and preservation of wildlife habitat) but which have no established prices, principles of production economics can be used to calculate what the minimum values of such products would be (Workman 1986).

The relationship between ecological continuity and other range benefits is worthy of consideration in performance evaluation (Bartlett 1984). Land productivity is an environmental indicator (see Table 3-1). The quantities, composition, and quality of vegetation for livestock consumption are important indicators for sustainable forage production and range management (AIS 2000). Assuming efficient management of the livestock operation, an important indicator of rangeland performance is the productivity of the rangeland. One common measure of productivity is the number of AUMs supported by an acre of rangeland. The greater the number of AUMs supported by an acre of rangeland, the better the performance (AIS 2000).

Net income per acre can also be used as an indicator of rangeland performance (AIS 2000). This allows the value of the livestock output to be considered as well as the carrying capacity of the rangeland. In addition, the use of net income as an indicator reflects the costs of production of the livestock operation and can be used to determine which livestock operations to invest in. Thus, while higher AUMs per acre may reflect superior rangeland quality, higher dollars per acre reflect superior livestock operations (AIS 2000).

Indicators that are closely linked to the environmental health and maintenance of rangeland and that are not captured in the price of land include biophysical indicators of vegetation and soil conditions (AIS 2000, see Table 3-1). Environmental quality may be maintained or improved with "proper" and moderate livestock grazing (Council on Agricultural Science and Technology 1974, cited by Bartlett 1984). For example, PAG Report #15 demonstrated that water quality can be protected by using best management practices for grazing in riparian areas (Mosley et al. 1997).

State and federal agencies are developing standards and management practices for sustainable livestock and forage production (AIS 2000). New Mexico, Colorado, Washington, and other states have been active in issues surrounding sustainable rangeland management. For example, the New Mexico State Land Office has developed the Range Stewardship Incentive Program which is designed to maintain and improve range conditions on 8.75 million acres of New Mexico state trust lands leased for grazing (Souder et al. 1996). In addition, the BLM in New Mexico has developed "Standards for Public Land Health and Guidelines for Livestock Grazing Management for New Mexico." These standards could perhaps be used as a template from which individual states can prescribe appropriate modifications (AIS 2000).

Performance Criteria and Indicators. The management decision process and performance measures must meet the needs of the designated beneficiaries of state trust land (AIS 2000). Financial criteria and indicators are basic measures of changes in measurable financial benefits. Environmental and social performance measures chronicle long-term and cumulative impacts on the land. These criteria and indicators can be described as having either a positive, negative, or neutral impact on future cash flow and asset value. When viewed over time, performance measures help both the trust manager and the beneficiaries understand and quantify trends. An understanding of the relationship between financial, environmental, and social factors will assist both the manager and beneficiary, and when required, will assist in explaining policy and programs to local and statewide political leadership, as well as to the general public (AIS 2000).

Table 3-1, presented in **Part 3.6.3**, provides examples of criteria and indicators recommended in the AIS (2000) report to the Western States Land Commissioners. These performance measures are basic means to measure gain or loss, usually

measured on the total portfolio, groupings of similar assets, or on a regional basis (AIS 2000).

Some additional considerations in the form of questions have been posed by the Idaho State Controller's Office (**Appendix G**). Many of the questions exceed the scope of the project we set out to do, but serve as a research agenda for pursuing pragmatic questions about endowment rangeland management.

5.7. Summary and Conclusions

Analysis of the results of studies that have been done in Idaho and in other states clearly seems to indicate that the state endowment rangelands are not producing "maximum long term financial return" to the beneficiaries, primarily as a result of pricing grazing leases at below-market rates for forage. The reasons seem to be social and political, rather than environmental.

Net income from ranching seems to be less important to many ranchers than other factors, primarily lifestyle or quality-of-life. Some ranchers thus may be willing to pay more for the opportunity to graze livestock on endowment lands than they are currently paying. Expectations of appreciation in land value are also a factor.

The effect of current grazing fee policy on endowment rangelands is that managing these lands is essentially a break-even operation. As summary statistics and financial performance indicators reveal, current levels of net income provide a return on asset value of approximately 1% when a defensible estimate of forage market value and a target rate of 4% are used (Table 5-4). Sensitivity analysis reveals that a higher target rate would result in a higher return on asset value because the LEV would be lower, with each 1% increase in the target rate increasing the ROA by 0.3% (Table 5-2).

It would be difficult to argue that the current income from rangelands is "maximum long term financial return" as the Idaho Constitution requires. There is undeniably a social value based on tradition in maintaining large areas of rangelands in Idaho, especially when the alternative is land parcellization into smaller units for a variety of land uses, including residential, recreational, and "ranchette" type of development. If underpriced grazing leases benefit ranchers at the expense of the public school beneficiaries, then the trust land mandate is not being upheld. In this respect endowment rangelands seem to be exempt from the mandate of the Idaho Constitution. There may be good reasons for that, but the end result may not be fair to public schools, the principal beneficiaries of endowment trust lands.

An appraisal at fair market value of endowment grazing lands is necessary to answer the basic question posed in *State Trust Lands* by Souder and Fairfax (1996): What is the value of these endowment rangelands to the lessee? A fair market value would become the rental paid by the lessee to the state. Ranch investment and policy analysis requires more thought than is offered by traditional cost-and-return studies about the economic value of livestock production (Torell and Bailey 2000). The economics of public land ranching being what they are, the trust mandate to provide "maximum long term financial return" on rangelands likely can be addressed with a representative study of ranch budgets and a reevaluation of current lease and fee arrangements, including adequate consideration of environmental as well as social factors, such as those provided in Table 3-1, that would protect the trust corpus in perpetuity.

If it is desirable to determine the fair market value of forage on endowment rangelands, then additional primary research is necessary. A fruitful avenue of research would be along the lines suggested by the policy analysis modeling based on ranch cost and returns conducted in Owyhee Country by Dr. Neil Rimbey of the University of Idaho and his colleagues (Rimbey et al. 1999, 2001). From similar studies across a variety of ranch classifications, it would be possible to develop estimates of what "typical" ranchers could actually afford to pay for endowment land grazing leases.

Policymakers have several alternatives for the management of underperforming rangeland assets, including [a] in increase in grazing fees to a rate that reflects the fair market value of endowment rangelands, [b] encouraging more competitive bidding on grazing leases, [c] selling or exchanging parcels of rangelands, or [d] making a policy statement explaining why low rates of return are acceptable. If performance evaluation indicates the current situation is unsatisfactory, these options are worth exploring. Additional ideas for doing so are provided in **Part 7.3**.

Table 5-4. Summary statistics and financial performance indicators, Idaho endowment rangeland, FY 1998-2000.

Statistics and Performance Indicators	FY 1998	FY 1999	FY 2000	Average
(a) Acres leased for grazing	1,837,568	1,837,568	1,837,568	1,837,568
(b) Animal unit months (AUMs) authorized	263,279	266,513	265,015	264,931
(c) Grazing fee, Idaho endowment land	$4.16 / AUM	$4.72 / AUM	$4.75 / AUM	$4.54 / AUM
(d) Cash income from grazing	$1,168,000	$1,283,800	$1,306,900	$1,252,900
(e) Cash expenditures for management	$885,900	$1,046,700	$986,300	$972,967
(f) Net income	$282,200	$237,100	$320,600	$279,933
(g) Net income per AUM	$0.90 / AUM	$0.89 / AUM	$1.21 / AUM	$1.06 / AUM
(h) Net income per acre	$0.13 / ac.	$0.13 / ac.	$0.17 / ac.	$0.15 / ac.
(i) Change in net income (year-to-year %)	-34.2%	-16.0%	35.2%	-5.0%
(j) Cash expenditures as % of cash income	75.8%	81.5%	75.5%	77.6%
(k) Idaho private land grazing fee	$10.80 /AUM	$11.10 /AUM	$10.90 /AUM	$10.93 /AUM
(l) Fee adjustment factor, private to public[1]	0.7	0.7	0.7	0.7
(m) Fair market value public land grazing fee	$7.56 / AUM	$7.77 / AUM	$7.63 / AUM	$7.65 / AUM
(n) Attainable net income from grazing[2]	$1,104,489	$1,024,106	$1,035,764	$1,053,755
(o) Land expectation value (LEV) @ 4%[3]	$27,612,231	$25,602,650	$25,894,100	$26,343,879
(p) LEV per acre @ 4%	$15.03 / ac.	$13.93 / ac.	$14.09 / ac.	$14.33 / ac.
(q) Return on assets, grazing income(ROA_G)[4]	1.1%	0.9%	1.3%	1.1%
(r) Return on assets, land value (ROA_L)[5]	5.9%	-7.3%	1.1%	-0.1%
(s) Total return on assets (ROA_{G+L})*	7.0%	-6.4%	2.4%	1.0%
(t) Land expectation value (LEV) @ 6%	$18,408,154	$17,068,433	$17,262,733	$17,562,585
(u) LEV per acre @ 6%	$10.02 / ac.	$9.29 / ac.	$9.39 / ac.	$9.56 / ac.
(v) Return on assets, grazing income (ROA_G)	1.6%	1.3%	1.9%	1.6%
(w) Return on assets, land value (ROA_L)	5.9%	-7.3%	1.1%	-0.1%
(x) Total return on assets (ROA_{G+L})*	7.5%	-6.0%	3.0%	1.5%

*See Table 5-1 for all steps in ROA calculation.

Footnotes summarizing calculation methods:

[1] Source: Bartlett et al. (2001). "Valuing public land forage," *Journal of Range Management.*

[2] (b) x (m)

[3] (n) / .04

[4] ((f) / (o) from previous year) x 100

[5] ((o) -(o) for previous year) / ((o) for previous year) x 100

Part 6. How Much Flexibility Do Trustees Have?

Under current provisions of the Idaho Constitution, land assets are to provide "maximum long term financial return" to the beneficiaries. As trustees overseeing the operations of the Idaho Department of Lands (IDL), the Idaho State Board of Land Commissioners (Land Board) is bound by that mandate. There are two situations to consider. First is the flexibility within the existing provisions. Second, the Idaho Constitution has been changed before and it could be changed again.

6.1. Current Provisions of the Idaho Constitution

The "maximum long term financial return" mandate sounds inflexible, but there are some degrees of freedom regarding decisions. Because no one knows for certain what will happen in the "long term," some consideration of how different factors that may affect land productivity, and thus returns to land assets, is necessary.

State constitutions are not as hidebound as conventional wisdom might suggest (Souder and Fairfax 1996). Notably, the revenue maximization mandate and associated full market value notion both possess porosity, allowing some flexibility in revenue generation and sustained yield in order to accommodate other considerations (Souder and Fairfax 1996).

Souder and Fairfax (1996) make a simple yet crucial observation: Managing to attain fair market value for the products sold from the trust lands is operationally different from managing those lands to produce maximum revenues from them (Souder and Fairfax 1996). The first requirement is reactive: if products such as timber are sold, they may not be sold for less than the fair market value. In contrast, revenue maximization may require managing lands in a specific manner before attempting to sell the resources. For example, in forestry a revenue maximization approach may have negative impacts on local communities and may cause revenue fluctuations, due to variations in the amount of timber being harvested from state trust lands, or in the type of product being grown, or in environmental consequences (Souder and Fairfax 1996). However, the impacts on local communities may be positive and revenue may be relatively steady (McKetta, review comments). Whichever the case, managers have a considerable amount of discretion in choosing how and on what terms to maximize revenues (Souder and Fairfax 1996).

6.1.1. Multiple Benefits

Endowment forest and rangelands produce multiple benefits, some of which may be of low value now but could be higher valued in the future. For example, western red cedar once had little stumpage value and now brings top dollar in timber markets. Rangelands once viewed primarily for forage production values may have higher values as wildlife habitat or recreation sites. Multiple benefits, however, must be viewed from the perspective of producing financial benefits for the beneficiaries.

There is undeniable tension between maximizing returns for the beneficiary and achieving general public benefits—including those that do not produce revenue (Souder and Fairfax 1996). But more broadly defined, general public benefits need not be incompatible with meeting the trustee's obligation of undivided loyalty to the beneficiary. Although that notion appears engraved in stone in cases such as *Skamania* (1984), a closer look at the state statutes and constitutions yields a significantly different perspective on the concept of the beneficiary. More room for approaching both goals simultaneously is, perhaps, to be found in the fundamentals of resource management—in answers to such questions as:

a. What is the product to be sustained?
b. What is the discount rate?
c. What is the desired periodicity in revenue flows? (Souder and Fairfax 1996).

This does not eliminate the potential for conflicts between trust land managers and environmentalists: those conflicts are real, important, and likely to be intense at times. It is important, however, to understand both the clear priorities of trust land management and the room for flexibility that exists underneath the seemingly rigid dictates of the trust (Souder and Fairfax 1996).

6.1.2. Sell or Hold?

Some of the issues triggering the request for this project were expressed by a PAG Advisory Committee member in the accompanying essay "Endowment 'Reform' Puts Lands on Auction Block" (Box 6-1). This essay poses several questions that are neither new, nor easy to reply to.

Box 6-1
"Endowment 'Reform' Puts Lands on Auction Block"
by Margaret Soulen Hinson

Just east of McCall is a section of land, now managed to provide revenues for Idaho's public schools, as mandated by the state Constitution and the laws which granted statehood to Idaho. Within this square mile of land are a prime fishing lake, streams and hiking trails, forests, and high mountain scenery. It is, in short, lovely.

It is also valuable, although the current use of the land—sheep grazing and limited logging—give no indication of the potential future revenues that might be derived from it. And therein lies a problem with the endowment reform package that our political leaders, the press and others believe so worthwhile. The concept upon which the reform is based, coupled with the venerable and well-tested provisions of trust law, is that assets not providing adequate returns must be converted to assets that make more money for the public schools.

How much would the land east of McCall be worth as a property available for subdivision into "wilderness home sites"? Let us assume a modest $100,000 for what might be advertised as "five beautiful acres, right in the heart of Idaho's pristine backcountry." At such a price, which is cheap compared with McCall property in general, this part of our state is worth $12.8 million. At even a 5 percent return on that amount of money, the sale of the land would produce $640,000 per year, roughly, 1,500 times the amount now paid to graze sheep on it.

"But this land's not for sale," one might observe and those who support the current endowment reform package will argue. They are, at best, misguided. Trust law requires that the trustees (the State Board of Land Commissioners) act with undivided loyalty to the beneficiaries of the trust, the public schools in this case. The constitutional mandate of Idaho's endowment lands is to provide maximum returns over the long term to the endowed institutions. When the Land Board ignores an offer that would increase annual revenues from a trust asset by a huge amount, they have failed to meet their trust responsibilities. And if they ignore such an offer in favor of maintaining the traditional use of the land, guess what? Some entity—a school board, a teachers group or the State Department of Education—will sue to assure the interest of the schools, the trust beneficiary, is protected.

Neither is the land near McCall an isolated example. Look at a map of Idaho that displays land ownership. All across the state are parcels of land managed by the state for the benefit of endowed institutions. Many are isolated, hard and costly to manage. Most provide annual revenues from grazing and every twenty years or so from logging. Some has little commercial value, but others—those with a spring, creek, or a small patch of trees and a view—are valuable real estate properties, and the potential returns from real estate development greatly exceed the current revenues from that land.

The endowment reform could indicate a grim future for lands with a potential value exceeding that defined by the current use. Indeed, as the Idaho Association of Commerce and Industry noted in its support for the endowment reform proposals, "So what does this mean to Idaho? First, the proposal would generate more money for schools, and the provisions on the constitutional amendments that give greater flexibility for endowment investments have merit." However, the political euphoria over more money for schools overlooks the costs of obtaining it.

If you're a rancher, consider the effect of having someone else owning that isolated section of state land in the middle of your grazing operation, particularly if that section has water or provides access to adjoining lands. If you're someone who hunts, camps or hikes, consider the loss of even a small part of the lands where you enjoy your leisure. And if you're like the vast majority of us who value our open, undeveloped spaces, consider the change when private, "recreational" development take their place.

Outdoor enthusiasts, ranchers and environmentalists all may have legitimate differences over how state lands ought to be managed. But in the midst of that debate, it is pretty certain that all would agree that these lands are better off as they currently exist than sold to the highest bidder and developed to exclude the interests of everyone but the new owners.

Among the issues raised in the essay (Box 6-1) are the following questions:

1. What is the "highest and best use" of the land parcel?
2. Who determines what the use of this land is to be?
3. Who can challenge the decision?

Replies follow: The "highest and best use" concept is how market forces determine how land is used (Barlowe 1978). In this case, land-use policy decisions are made by the Land Board. The reply to the third question lies at the heart of issue. Who has standing to challenge the decision? The answer depends first of all on which of the nine beneficiaries the parcel belongs to, and who can represent the beneficiary fund in court. If the beneficiary is content with the current or planned "long term financial return" from the parcel under the current land use, then the beneficiary is unlikely to challenge the decision. If, however, the beneficiary views the potential long term financial return from selling the land as more desirable than the long term financial return from current use, then the beneficiary can challenge the Land Board at any time by bringing suit. The beneficiary of course may weigh non-financial factors in deliberations. Similarly, if the Land Board decides to sell the parcel and the beneficiary prefers the current land use, then an appeal can be made to the Land Board. If the beneficiary feels strongly enough about it, the decision to sell can be challenged in court.

There is one more point to consider. If the beneficiary brings suit, it is not up to the beneficiary to demonstrate that the trustee did not act prudently. Instead, the trustee (i.e., the Land Board) must demonstrate that it acted prudently.

Should the Land Board consider selling an isolated section? It would likely be imprudent not to consider the sale from a financial standpoint. The monetary value could be considerably greater than that provided by the current land use. It would also be imprudent not to consider the long term non-financial environmental and social benefits that may be foregone. The beneficiary, or the trustee, may place more value on the non-monetary value of the land than the monetary value, regardless of how much money the parcel could fetch in the market.

What about the "maximum long term financial return" mandate? That would be a good argument for selling the land if the cash flow stream pencilled out better under the sale option than the hold option. Only the beneficiary would have standing to challenge the decision. It may therefore be prudent for the trustee to attempt to determine whether or not the beneficiary would challenge the decision, one way or the other.

The "maximum long term financial return" mandate sounds inflexible, but there are some degrees of freedom regarding decisions. Managers have a considerable amount of discretion in choosing how and on what terms to maximize revenues.

6.2. Amend the Idaho Constitution

The Idaho Constitution (**Appendix A**) has been amended before and it can be amended again. The "maximum long term financial return" stipulation was added in 1962. The endowment reform provisions (see **Part 2.3**) were added as amendments in 2000 (**Appendix B**). Although no one knows for sure what the "long term" has in store, it is close to a certainty that Idaho's population will grow as more people move to the state. Consider that the U.S. population is expected to increase by 50% in the next 50 years (USDA Forest Service 2000). It would be prudent to consider what is happening to state trust lands in other more populous states (see Box 6-2).

It is conceivable that new challenges could arise to broaden the mandate so that environmental and social values are given increased weight relative to financial values. The lesson from Box 6-2 is that at sometime in the future there will be pressure to set aside portions of the endowment land assets from the "maximum financial return" mandate, either with or without a change in the Idaho Constitution. However, even if there is not, there are costs associated with addressing legal challenges to the mandate. As Souder and Fairfax (1996) point out, it is not *revenue* production that the trust lands are to sustain, but financial *return*. A *revenue* goal perhaps need not consider the full range of cash costs, but the *return* goal certainly does.

Box 6-2
"Pressure from growth in the West forces more balanced use of state lands"

As the second-fastest growing state in the nation, Arizona is home to a dispute among conservationists, developers, educators and the Arizona Land Department over the future of state trust lands. This quarrel is setting the stage for similar slugfests throughout the West.

Like most Western states, Arizona's 9.3 million acres of trust lands are managed by an understaffed state agency operating under an 89-year-old mandate to maximize profits for school funding. The Land Department spends most of its time being buffeted by conflicting public demands.

The result? Stalemate. Hardly any trust land is being developed, key open spaces aren't protected and the school fund is growing at a snail's pace. The status quo pleases no one.

Sensing an opportunity to break the deadlock, Arizona's conservationists are partnering with a faction of developers to produce what seems like a win-win proposal.

The unusual coalition will sponsor a ballot initiative in 2002 to set aside 10 percent of trust lands for conservation and add environmental issues to the mix of values guiding the Land Department's mission. Colorado voters approved a similar initiative in 1996.

The Land Department says it will support the initiative only if supporters find the money to pay for the protected land.

Source: verbatim excerpts, L. Alder (Sept. 5, 2001) "Writers on the Range," *Idaho Statesman*, Boise.

6.3. Summary and Conclusions

The seemingly inflexible "maximum long term financial return" mandate of the Idaho Constitution does offer some management flexibility. It is reflected in policy decisions to protect viewsheds by modifying timber harvest (e.g., Priest Lake) at a substantial opportunity cost to the beneficiaries (Wiggins, review comments), and to allow grazing leases at less than what the fair market value of the forage might be.

Evaluating the financial performance of endowment land assets only with financial indicators such as rate of return on asset value is but a part of an economic performance evaluation, which also needs to consider environmental and social values. Nevertheless it is appropriate that the level of "maximum long term financial return" from these lands be determined so that the beneficiaries of the trust, and the people of Idaho, know the opportunities that are foregone by selecting one management option instead of another. Opportunity costs work both ways. In some situations the financial values from timber sales and/or grazing leases may be less than the non-financial benefits foregone, or the environmental and social costs of the management decision.

Management flexibility is reflected in policy decisions to protect viewsheds by modifying timber harvest (e.g., Priest Lake) at a substantial opportunity cost to the beneficiaries, and to allow grazing leases at less than what the fair market value of the forage might be.

Endowment lands can produce cash for the public schools, but they are not a cash cow. Financial performance criteria have limited utility in comparing public land assets to other classes of assets, but financial analysis is a basic building block for an asset management plan. An acre of Idaho forest or rangeland just is not the same thing as a certificate for shares of stock in a corporation. A full range of financial, environmental and social indicators could be developed to represent the interests of trust beneficiaries and the people of Idaho (see, for example, Table 3-1). These lands always have been and will continue to be a "sacred trust" (see PAG Report #1, O'Laughlin 1990) requiring stewardship of a broader set of values. While the full range of values is being considered, it is still conceivable that financial returns could be increased significantly above current levels through considering different management options.

Part 7. Management Alternatives for Financially Underperforming Land Assets

Parcels of state trust lands may be judged to be underperforming whatever financial goals have been set as targets. Three general approaches are available to improve poor performance. First, reconsider the performance criteria by determining if the benchmark standard or goal is appropriate, and change it if not. Second, modifications in management policies or practices may improve financial performance. Third is disposal, either by selling the land or exchanging it for other lands. This part of the report briefly considers adjustment of indicators and disposal, and provides a more thorough analysis of management alternatives for underperforming forest lands and rangelands.

Performance Indicator Adjustment. The endowment trust lands currently do not have established financial performance goals. If goals are established, it would likely be prudent to label them as interim or temporary goals. This may alleviate some of the anxiety managers, lessees, and the general public may have with the idea that their current expectations or aspirations for these lands will be radically modified. Perhaps it would be prudent to consider environmental and social goals in the same respect. After some interim period of time, not only the performance of land managers and land assets can be evaluated, but also whether the criteria and indicators are appropriate for the task.

Three general approaches are available to improve poor performance. First, reconsider the performance indicators by determining if the benchmark standard or goal is appropriate, and change it if not. Second, modifications in management policies or practices may improve financial performance. Third is disposal, either by selling the land or exchanging it for other lands.

7.1. Disposal

"Disposal" of lands involves exchanging a parcel of land for cash or for another parcel of land, or selling it. The managers of state trust lands are held by case law to sales or exchanges at fair market value. A general objective of disposal would be to reduce management costs through consolidation of land holdings.

7.1.1. Sell the Land

Perhaps the most elementary question in trust land management is whether the trust lands should be retained or sold (Souder and Fairfax 1996, see Box 6-1). Under the trust concept, the lands will be retained if the trustee believes the lands will continue to provide net revenue for the beneficiary in excess of what disposal of the lands might provide.

Idaho has sold more than one million acres of its original endowment lands. How much of the almost 2.5 million acres in the asset portfolio should be retained is a question of considerable importance, especially since Endowment Fund reform has redefined the risk/return relationship for managers and beneficiaries of the endowment assets.

7.1.2. Exchange the Land

All too often scattered land parcels have limited accessibility, thereby limiting the number of potential lessees (AIS 2000). Secondly, the management of large, contiguous parcels may be more efficient and less costly than smaller, scattered parcels. The creation of larger blocks of lands may have significant benefits with regard to forested lands and for some range lands. A key issue in maximizing the financial return is to have land parcels of a size and location that are accessible and can generate the most bidders. Washington State reports improved returns with larger parcels while Oregon reports higher value per acre for smaller rangeland parcels than larger, blocked parcels. A key issue is access to the parcel under management (AIS 2000).

At this writing the PAG is considering undertaking a separate project to analyze the potential benefits and costs of land exchanges in Idaho. The potential efficiency of land exchanges for agency managers may not be realizable for many reasons, including first and foremost reservations by members of the public who have become accustomed to current land ownership patterns.

7.2. Forest Land Management

From the financial perspective the primary purpose of forest management is manipulating the growing stock in order to achieve the best possible net return on the total investment in land and timber (Zinkhan et al. 1992). Management decisions, each covered briefly in this section, include silvicultural activities, timber harvesting, and the guidelines for when to cut trees or hold timberlands in an investment portfolio. The significance of the target rate of return is overwhelmingly important in all these decisions.

From the financial perspective the primary purpose of forest management is manipulating the growing stock in order to achieve the best possible net return on the total investment in land and timber.

7.2.1. Silviculture

Increasing sophistication on the part of timberland investment managers has led to an increased likelihood of improved cash flow (Whitaker et al. 1999). Active forest management, known as silvicultural practices, has progressed substantially recently in its ability to protect tree stands and to promote tree growth. Site preparation, fertilization, and improved planting stock, along with thinning, pruning and culling, all promote better growth in the tree stand. Insect and disease management activities, access roads for fire control, and fire or wind breaks protect the forests. The results of plantation management techniques have produced substantial improvements in timberland productivity to date, and expected future improvements in silvicultural techniques may increase the productivity of existing timberlands even more. From an investment perspective, higher productivity means more timber available for sale in less time, resulting in higher potential returns (Whitaker et al. 1999). Sometimes extensive management is more profitable and environmentally desirable than intensive silviculture (Keegan, review comments).

The interest rate used to discount costs and future returns from silvicultural treatment projects will determine whether the investment in intensive management is financially feasible.

The term "intensive forest management" generally means substantial financial investments in silvicultural activities (Zinkhan et al. 1992). Intensive forest management generally entails dividing a forest property into management units. Before prescribing silvicultural treatments, the forester investigates each unit to determine what can be done to improve net value growth. The series of treatments recommended depends upon the characteristics of the unit, the owner's objectives, and budget constraints (Zinkhan et al. 1992). Intensive silviculture needs to be carefully considered, as it may alter habitats for wildlife and could have negative aesthetic characteristics.

Thinning is a silvicultural treatment that can add value to the stand and improve general stand conditions. Denser stands can produce relatively high levels of cubic volume per acre, but the trees will likely have narrow growth rings, small average diameters, less vigor, and be more susceptible to insect and disease attacks. Overstocking not only reduces the trees' vigor for fighting insect attacks, but also enables insects to move more easily from tree to tree during an infestation (Zinkhan et al. 1992).

Fertilizing and planting can also increase the value of timber resources. "Intensive" silviculture means that substantial costs are involved. Financial analysis determines the degree of intensity. The interest rate used to discount costs and future returns from silvicultural treatment projects will determine whether the investment in intensive management is financially feasible.

7.2.2. Timber Harvesting

Timber harvesting is an indispensable forest management tool that can help attain sustainable forest management objectives, including improvements to ecological conditions, and meeting socially desirable goals through economically viable management strategies (Cook and O'Laughlin 2000, SAF 2001).

A final and inescapable responsibility of the timberland manager is to recommend, and usually to determine, what, where, when, and how much timber to cut from the forest (Davis 1966). Timber harvest is the objective and culmination of the whole timber-growing sequence. It is through cutting that the manager exerts his/her most decisive influence over the forest. Determination of the cut is therefore of fundamental importance both in supporting current financial objectives and in shaping the future (Davis 1966).

Considerations in determining the amount of

timber to harvest, and when, called the cutting age, can be stated briefly. It is necessary to know for a period of usually from 5 to 20 years in the future:

1. The total volume of timber to cut;
2. The kind, quality, and size of timber cut to compose this volume; and
3. Where this timber is to be harvested and under what cutting specifications it is taken from the forest (Davis 1966).

The timber harvest decision is not a simple matter, for many things must be considered and brought into a working balance, including:

1. The purposes of management, including operating policies and aims, income needs, and continuity of operation desired;
2. Markets for different kinds of timber;
3. Silvicultural needs and exigencies;
4. Logging problems; and
5. Degree of harvest continuity desired, which means establishing a cut within the sustained productive capacity of the forest that will make satisfactory progress toward, or maintain, as the case may be, desirable regularity regarding distribution of timber age, size, and quality (Davis 1966).

In addition, the costs of establishing and monitoring timber sales, and the costs of investment to perpetuate forest growth, are important determinants of net return (McKetta, review comments). Determining the timber harvest schedule, or allowable cut, means reconciling many and often more or less conflicting considerations (Davis 1966). Silviculturally, conditions may call for an improvement or salvage cut in an area without adequate roads, necessitating high costs for building roads. Capital costs of ownership call for a large cut, but market conditions may be unfavorable (Davis 1966). Timing harvests to markets may be important in optimizing returns to the trust (McKetta, review comments).

The nature of the forest is a saving feature, as the forest crop can be stored on the stump, except in the case of salvage following sudden mortality (Davis 1966). The forest, because it is a "factory," continues to add product while it is being stored. This fact gives the manager considerable flexibility. Seldom does a forest absolutely have to be cut in a given year or period of time (Davis 1966). This flexibility gives managers the option to time harvests to market conditions (McKetta, review comments).

The financially optimal rotation or cutting age is when the forest value growth percent equals the owner's target rate of return.

7.2.3. When Should Trees Be Cut?

Forest management involves more than determining the appropriate rate and time at which to harvest timber, but timber harvest is a fundamentally important decision. There are two general cases in managing forests: even- and uneven-aged. Think about two extreme cutting ages for clearcutting an even-aged stand of timber: [1] cut the trees too early, and they are too small to provide revenue; [2] wait too long, and potential revenue from year to year timber growth stagnates or even decreases due to mortality. In both cases, the land expectation value (LEV) will be less than optimum. If the manager calculates the LEV for different rotation ages between these extremes, the LEV rises, reaches a maximum at the economially optimum clearcut age, called financial maturity, and then falls again. This occurs because beyond the optimum rotation age, the value growth rate of the forest falls below the owner's minimum acceptable rate of return (Klemperer 1996). This minimum return is the target rate established to, among other things, guide management decisions.

The biological rotation age that maximizes mean annual increment is usually not the financially optimal cutting age (Klemperer 1996). In even-aged management, the financially optimal rotation or cutting age is when the forest value growth percent equals the owner's target rate of return. This is also the clearcutting age yielding the highest LEV. The financially optimal timber harvest plan is the one that maximizes the LEV. These harvest schedules are initial best estimates, which usually change as the future unfolds (Klemperer 1996). The opportunity cost of land also is included in the decision process through the selection of a target or discount rate of interest.

Uneven-aged management can also be approached using the same tools to determine the optimal cutting cycle timber harvest schedule. Those tools are a target interest rate to guide decision and the discounted cash flow of management alternatives (Bullard and Straka 1998).

7.2.4. Importance of the Target Rate of Return

The importance of the target rate in forest land management is not only its use in establishing the LEV criterion, but also its effect on the cutting decision and intensity of management. From a purely financial perspective, an optimal rotation age is the one which will maximize the timberland's LEV. This optimal rotation age depends upon assumptions concerning timber yields at alternative ages, the discount rate, forest management practices to be implemented, stumpage price growth rates, forest management costs, and other factors. Recall the analysis in **Part 4.3.2**, especially Figure 4-6. The difference between the biological and financial rotation ages for Idaho endowment lands is several decades. For example, the high-site timberlands in the Clearwater region reach maximum mean annual increment at age 84. At a 4% target rate, the financially optimal cutting age would be 57 years (see Figure 4-6). At higher target rates of 6% and 8%, the cutting age is shortened to 53 years and 47 years, respectively. At lower target rates of 3% and 2%, the cutting age is extended to 63 and 74 years, respectively. By comparison, using the maximum mean annual increment as a decision guide, the cutting age of 84 years implies that the forest manager is using a guiding or target rate of return of approximately 1.3% (Figure 4-6).

The importance of the target rate in forest land management is not only its use in establishing the LEV criterion, but also its effect on the cutting decision and intensity of management.

From a financial standpoint, which cutting age is optimal? If the board-foot unit value of timber from trees at age 47 is the same as it is at ages 53, 63, 74, or 84 years, then the board-foot volume growth in Figure 4-6 provides the answer. The optimal cutting age is when the annual percentage increase in stand value growth falls below the target or guiding rate of return. If the target rate is 4%, the optimal cutting age is 57 years.

To sum up, the financially optimal rotation age will seldom if ever coincide with the age expected to maximize total board foot volume (Zinkhan et al. 1992). A stand's net volume and value might still be increasing through growth at the age of maximum board foot volume, but the annual percentage increase in value might be less than the relevant opportunity cost of funds, i.e., the discount rate, target, or guiding rate of return. Therefore, it would be logical from a financial perspective to harvest such a stand before maximum board foot volume is attained. An immediate harvest would not only bring in harvest proceeds earlier, to be reinvested at the target rate, but also it would allow for an earlier initiation of the second rotation, the third rotation, the fourth rotation, etc., moving their cash flows closer to the present time and increasing their present value (Zinkhan et al. 1992).

Most timberland investors would probably deviate slightly from the financially optimal rotation age (Zinkhan et al. 1992). A harvest might be accelerated if disease or insects are a threat, or if immediate income is needed. If stumpage prices are depressed once the stand has reached its financially optimal rotation age, and they are expected to recover, then the harvest might be delayed (Zinkhan et al. 1992).

Small rotation age changes do not influence timberland value estimates to the same degree as stumpage market conditions (Zinkhan et al. 1992). This is especially true for stands managed with thinning regimes. Thinned stands can generally maintain respectable growth rates and avoid biological risks for longer periods of time than unthinned stands. The optimum rotation age should be viewed as a general goal, not a specific requirement for successful forestry (Zinkhan et al. 1992).

7.2.5. Sell or Hold?

Should all endowment forest lands remain in the investment portfolio? If some are to be sold, which parcels and at what time? These are all important questions. Once a decision has been made to liquidate forest land, the hold or sell decision becomes one of timing.

Forest liquidation value is the potential income from clearcutting and selling the land; holding value of an even-aged forest is the present value of future liquidation at the optimal rotation age (Klemperer 1996). Forests that have not yet reached the optimal cutting age when LEV is maximized at the target rate of return are financially immature. The holding value for immature forests exceeds liquidation value. For financially mature forests, holding value is less than or equal to liquidation value (Klemperer 1996).

Here once again, the importance of the target rate of return is evident, because the present value of

the forest or the stand is determined by the rate of interest used to discount future cash flows to the present.

7.2.6. Non-Financial Factors

Sound forest management requires expertise in a variety of disciplines and long-term planning (Zinkhan et al. 1992). Decisions made today can have an impact on forest growth rates decades into the future. Like most tasks that involve long-term planning, clearly identifying the owner's objectives is a crucial step. Periodic monitoring of the forest's health and structure, timber and timberland market conditions, and one's own objectives and constraints is a prerequisite to making mid-course corrections in forest management plans (Zinkhan et al. 1992).

In an environmentally sensitive society, increases in the scope and intensity of forest practices regulation are probably inevitable (Zinkhan et al. 1992). This also complicates long-term forest management planning. State forestry agencies already regulate all forestry practices in many western states. For example, there are requirements associated with the timing of reforestation, stocking levels of seedlings, and harvesting operations (Zinkhan et al. 1992, Ellefson et al. 1997).

Is the "maximum long term financial return" mandate flexible enough to allow consideration of non-financial factors? Trust managers must act to protect the productive capability of the endowment lands to produce revenue. To the extent that environmental and social impacts would negatively affect that capability, they need to be considered.

Environmental and social factors can affect the long-term performance of endowment land assets. For example, adding non-monetary benefits derived from standing timber can lengthen the optimal rotation or cutting age, sometimes to where it is no longer feasible to harvest timber at all (Klemperer 1996). Non-financial factors that will influence financial performance can be identified and addressed through an institutionalized process for analyzing how various management options meet different environmental and social criteria, in addition to financial performance. The list of such factors in Table 3-1 is a starting point for incorporating these considerations in management decisions.

The opportunity cost concept is the basis for considering not only what financial opportunities are foregone by elevating environmental and social considerations, but vice versa. The environmental and social values that may be foregone by emphasizing financial returns need also to be considered.

Is the "maximum long term financial return" mandate flexible enough to allow consideration of non-financial factors? As discussed in **Part 6**, the trust managers must act to protect the productive capability of the endowment lands to produce revenue. To the extent that environmental and social impacts would negatively affect that capability, they need to be considered.

7.3. Rangeland Modifications

When rangelands are not meeting the expectations expressed in financial, environmental, or social performance criteria, the lands can be sold, exchanged, or managed differently. The sale or exchange options are similar to those involving forest lands (see **Part 7.1**), except for the ***Reversion and Leasehold Interests*** (see **Part 5.1.1**). This part of the report considers grazing lease modifications as a way to improve rangeland management performance.

7.3.1. Modifying the Grazing Lease System

In a performance audit of the Arizona State Land Department, two relevant findings were:

1. The Department should regularly evaluate methods and credits it uses to set lease rates to ensure fees generate fair market value for public schools and other trust beneficiaries.

2. Another way to potentially increase revenues for public schools and other trust beneficiaries is to implement procedures that encourage competition for available leases (Norton 1997).

Grazing Fees. There are two related questions regarding grazing fees: What is the underlying value of the lands, and what percentage of the value is an equitable fee? (Souder and Fairfax 1996). Problems with a system using grazing fees arise from issues raised by the question posed above: the land values used to set the minimum base fees are low and/or unrepresentative of the leased areas; and the percentage capitalization is also low, especially when

compared to the potential returns on even a conservatively invested permanent fund. This is certainly the case in Idaho, with grazing leases providing a 1% or 2% return on assets (Table 5-4). If grazing leases are competitive, the grazing fee becomes less important because the difference will be made up at the auction for the lease (Souder and Fairfax 1996).

In Idaho, the "conflict bid" process allows eligible applicants to bid against the current leaseholder when the lease expires. The one-time conflict bid payment does not modify the grazing fee or subsequent annual lease payments (**Part 5.1.1**). In August 2001 the Idaho Department of Lands proposed changes in the administrative rules governing conflict bids (IDAPA 2001c) that were designed to be consistent with the new land classification policy adopted by the Land Board (**Appendix D**). The Land Board approved these proposed rules (IDL 2001d), and the Senate Committee on Resources and Environment will review the proposed rules during the 2002 session of the Idaho Legislature.

In the absence of competition, the method used to establish the grazing fee acquires paramount importance. The fee-setting systems discussed by Souder and Fairfax (1996) can be a starting point for establishing the fair market value for grazing leases. The issue, however, is how well the different parts of the fee system, as well as the overall leasing procedures, work in practice now and in the future. Two of the fee systems possess the attributes of being equitable, being simple to administer, and encouraging good stewardship. Those are the *comparable sales* approach, and the *cattle price share* approach. The *comparable sales* approach works well in areas where sufficient private leases exist to provide an adequate number of examples to use in setting the state fees. Where adequate private leases are not available for comparison, the *cattle price share* method seems preferable because of its simplicity and clarity (Souder and Fairfax 1996).

In the absence of competition, the method used to establish the grazing fee acquires paramount importance. Land ownership pattern and established leasing procedures to a large extent influence how competitive the leases are.

The *income capitalization* approach to setting grazing fees has appeal to the beneficiaries and, sometimes, to the state because the percentage paid as fees is directly comparable to other methods of trust performance such as return on the permanent fund. Souder and Fairfax (1996) reported that Wyoming was the only state that used this approach. However, the statute was repealed in 1997. It allowed Wyoming to charge from 2 percent to 5½ percent of the appraised land value as a grazing fee.

Competitive Bidding. Grazing fees are only part of the overall package that constitutes a grazing lease (Souder and Fairfax 1996). Land ownership pattern and established leasing procedures to a large extent influence how competitive the leases are.

What Would an Ideal Leasing System Look Like? There is a tension between the lessee and trustee regarding who benefits from which arrangements (Souder and Fairfax 1996). A fruitful way to summarize all this detail is to offer a hypothetical "ideal" leasing system.

Box 7-1 is not offered as a recommendation for change, but rather a place to start asking questions about how different leasing systems match the goals and objectives for specific parcels of rangelands (Souder and Fairfax 1996). First, the objective of the leasing program needs to be defined. Here we assume it is to return to the trust the fair market value of the resource, while protecting and enhancing the productive capabilities of the trust corpus. With this objective in mind, and recognizing the limits imposed by the existing geographical pattern of the lands and the existing lessees, the first part of a management strategy would be to classify the rangelands according to their potential to meet the state's management objective. After the lands have been properly classified, strategies specific to each type of land can be developed (Souder and Fairfax 1996).

Box 7-1
Three Rangeland Management Strategies and Leasing Arrangement

1. *Intensive* management strategies can be cost-effective for blocked lands of good quality. In this case, the state should be willing to make investments that improve the productivity of the lands, such as water developments, cross-fencing, brush control, and access. However, the state should retain ownership of these improvements to reduce impediments to competitive bidding for the leases. If true competitive bidding prevails, then theoretically the rental fee system that the state uses becomes less important in determining whether the state obtains fair market value, since bonus bids will make up the difference between the [grazing] fee and the value of the lease to the lessee. For blocked parcels designated for intensive management, a competitive bidding system involving advertising, written or oral bids, and a lease term of five to ten years with no right of renewal would appear to be optimal.

2. State parcels identified for *retention*, but not for intensive management, should be managed under different lease procedures. Management efforts should be made to facilitate the conversion of use from agriculture and grazing to the highest and best potential use. This might involve, for example, obtaining legal access to the parcels, working with county or local agencies to rezone the lands, and in some cases going so far as to plat the lands to increase their future sale value. Leasing procedures should emphasize the changing nature of the tenure by restricting the current lessees from making capital-intensive improvements; neither should the state make investments that are not beneficial for the expected future use. Any existing approved lessee improvements should be placed on an accelerated depreciation schedule. Fees charged for agriculture and grazing use should reflect the fact that this is an interim land use, pending ultimate conversion to other uses or sale. Fees could be established either by using a revenue share system or by adopting a base fee adjusted by price indexes. Competition for leases should not be emphasized unnecessarily, but neither should any preference rights be granted that allow the existing lessee to purchase the lands if the state decides to sell them.

3. Parcels identified for *disposition* due to their small, isolated, and/or uneconomical nature should be placed under strictly custodial management. Lease terms should be short, perhaps only annual. No improvements should be permitted, and existing ones should be depreciated. If no legal access exists to the property, and if the state believes that the costs of obtaining access would be justified by higher selling prices, then the state should attempt to obtain access. The existing lessees may be given rights to renew, but they should be given no preference right to purchase the property, subject to the following condition: if the benefits of obtaining access do not outweigh its costs, the state should attempt to sell the lands to the adjacent landowner at an appraised fair market price. Revenues received from these land sales could go either into the permanent fund (as is traditional) or, perhaps better, into a "land bank fund" to purchase other cost-effective replacement properties.

Source: *State Trust Lands* (Souder and Fairfax 1996).

Land Classification. The land classification process proposed by Souder and Fairfax (1996) mirrors the historical disposal, retention, and management theme, as states appear to be using three such types of rangelands for grazing purposes:

1. Blocked, fenced lands with legal access that occupy large enough parcels to make them economical for someone besides the adjacent landowners to use. These lands would seem to be most suitable for intensive management in support of their existing uses.

2. Lands that may have potential for other uses in the short or long term, such as parcels located on the fringes of urbanizing areas, near major highways, close to developing recreational areas, or with topographic features that make them suitable for communication sites or other special uses. The state may do well to retain such lands until the anticipated future uses can be arranged.

3. Lands in isolated, dispersed, small parcels that have no legal access and only one or a few surrounding landowners, and that are prohibitively expensive to manage (such as in terms of fencing and water) compared to their potential revenue returns. These lands would be those that are clearly uneconomical for the state to manage, and thus should be disposed of either by sale or by exchange (Souder and Fairfax 1996).

Management Strategy by Land Classification. Different management strategies and different leasing procedures are called for with the different categories of land uses (Box 7-1). Souder and Fairfax (1996) emphasized how the states' agriculture and grazing programs are beginning to emerge from a long period of domination by their lessees. Frequently driven or empowered by court decisions, trustees are developing programs for managing widely dispersed resources in a financially efficient manner. Key aspects of this evolution include establishing fee systems and leasing procedures that provide incentives for good management, while at the same time allowing a competitive process to set the fair market value for the resources produced from these trust lands. Although the balance between the state and the lessee continues to shift in favor of the trust beneficiary, the important variable in determining the pace of this reconfiguration continues in many states to be the lessees' political power (Souder and Fairfax 1996).

7.3.2. Non-Financial Factors

Environmental and social factors can affect the long-term performance of endowment land assets. These factors can be identified and addressed through an institutionalized process for analyzing how various management options meet different environmental and social criteria, in addition to financial performance. The list of such factors in Table 3-1 is a starting point for incorporating these considerations in management decisions.

The opportunity cost concept is the basis for considering not only what financial opportunities are foregone by elevating environmental and social considerations, but vice versa. The environmental and social values that may be foregone by emphasizing financial returns need also to be considered.

7.4. Summary and Conclusions

If lands are underperforming expectations when measured against financial, environmental, or social criteria and indicators, the performance measures can be readjusted, land can be managed differently, or the poorly performing land assets can be disposed of by sale or exchange. Financial returns to forest land assets might be increased by intensive silviculture activities and by reducing the cutting age, using the target rate of return as a guide.

Financial returns to rangeland assets can be increased by changing grazing fee policies. This includes increasing the minimum price per forage grazing unit to something approaching fair market value, or by encouraging more competitive bidding, or both. Environmental and social performance shortcomings would also indicate a need to change management strategies, perhaps by creating new land classifications that are not expected to "maximum long term financial return" mandate.

Appendix A. Constitution of the State of Idaho, Article IX Education and School Lands.

Sections of the Idaho Constitution below are those pertinent to Endowment Fund "reform" issues, with new language from 1998 and 2000 amendments indicated by *italics*, and ~~strikethrough~~ for deleted language.

SECTION 3. PUBLIC SCHOOL *PERMANENT ENDOWMENT* FUND TO REMAIN INTACT. The public school *permanent endowment* fund of the state shall forever remain inviolate and intact; the ~~interest thereon only shall be expended~~ *earnings of the public school permanent endowment fund shall be deposited into the public school earnings reserve fund and distributed* in the maintenance of the schools of the state, and ~~shall be distributed~~ among the ~~several~~ counties and school districts of the state in such manner as may be prescribed by law. No part of ~~this~~ *the public school permanent endowment* fund~~,~~ principal ~~or interest,~~ shall ever be transferred to any other fund, or used or appropriated except as herein provided. *Funds shall not be appropriated by the legislature from the public school earnings reserve fund except as follows: the legislature may appropriate from the public school earnings reserve fund administrative costs incurred in managing the assets of the public school endowment including, but not limited to, real property and monetary assets.* The state treasurer shall be the custodian of ~~this~~ *these* funds, and the same shall be securely and profitably invested as may be by law directed. *As defined and prescribed by law,* the state shall supply ~~all~~ losses ~~thereof that may in any manner occur~~ *to the public school permanent endowment fund, excepting losses on moneys allocated from the public school earnings reserve fund.*

SECTION 4. PUBLIC SCHOOL *PERMANENT ENDOWMENT* FUND DEFINED. The public school *permanent endowment* fund of the state shall consist of the proceeds *from the sale* of such lands as have heretofore been granted, or may hereafter be granted, to the state by the general government, known as school lands, and those granted in lieu of such; lands acquired by gift or grant from any person or corporation under any law or grant of the general government; and of all other grants of land or money made to the state from the general government for general educational purposes, or where no other special purpose is indicated in such grant; all estates or distributive shares of estates that may escheat to the state; all unclaimed shares and dividends of any corporation incorporated under the laws of the state; all other grants, gifts, devises, or bequests made to the state for general educational purposes; *and amounts allocated from the public school earnings reserve fund. Provided however, that proceeds from the sale of school lands may be deposited into a land bank fund to be used to acquire other lands within the state for the benefit of endowment beneficiaries. If those proceeds are not used to acquire other lands within a time provided by the legislature, the proceeds shall be deposited into the public school permanent endowment fund along with any earnings on the proceeds.*

SECTION 7. STATE BOARD OF LAND COMMISSIONERS. The governor, superintendent of public instruction, secretary of state, attorney general and state controller shall constitute the state board of land commissioners, who shall have the direction, control and disposition of the public lands of the state, under such regulations as may be prescribed by law.

SECTION 8. LOCATION AND DISPOSITION OF PUBLIC LANDS. It shall be the duty of the state board of land commissioners to provide for the location, protection, sale or rental of all the lands heretofore, or which may hereafter be granted to or acquired by the state by or from the general government, under such regulations as may be prescribed by law, and in such manner as will secure the maximum long-term financial return to the institution to which granted or to the state if not specifically granted; provided, that no state lands shall be sold for less than the appraised price. No law shall ever be passed by the legislature granting any privileges to persons who may have settled upon any such public lands, subsequent to the survey thereof by the general government, by which the amount to be derived by the sale, or other disposition of such lands, shall be diminished, directly or indirectly. The legislature shall, at the earliest practicable period, provide by law that the general grants of land made by congress to the state shall be judiciously located and carefully preserved and held in trust, subject to ~~disposal~~ *sale* at public auction for the use and benefit of the respective object for which said grants of land were made, and the legislature shall provide for the sale of said lands from time to time and for the sale of timber on all state lands and for the faithful application of the proceeds thereof in accordance with the terms of said grants; provided, that not to exceed one hundred sections of state lands shall be sold in any one year, and to be sold in subdivisions of not to exceed three hundred ~~and~~ twenty acres of land to any one individual, company or corporation. The legislature shall have power to authorize the state board of land commissioners to exchange granted or acquired lands of the state on an equal value basis for other lands under agreement with the United States, local units of government, corporations, companies, individuals, or combinations thereof.

SECTION 11. ~~LOANING~~ *INVESTING* PERMANENT ENDOWMENT FUNDS. The permanent endowment funds other than funds arising from the disposition of university lands belonging to the state, ~~shall~~ *may* be ~~loaned on~~ *invested in* United States, state, county, city, village, or school district bonds or state warrants or ~~on such~~ other investments ~~as may be permitted by law under such regulations as the legislature may provide~~ in which a trustee is authorized to invest pursuant to state law.

Appendix B. Amendments to the Idaho Constitution Affecting Endowment Funds, and Legislative Councils' Statements For and Against the Amendments.

House Joint Resolution No. 1, Idaho Legislature 2000

"Shall Section 4, Article IX of the Constitution of the State of Idaho be amended to:

1. Change the name of the Public School Fund to the Public School Permanent Endowment Fund;
2. Provide that the fund shall consist of proceeds from the sale of school lands and amounts allocated from the Public School Earnings Reserve Fund;
3. Provide that proceeds from the sale of school lands may be deposited into a land bank fund to be used to acquire other lands within the state; and
4. To provide that if those proceeds are not used to acquire other lands within a time provided by the legislature, the proceeds shall be deposited into the Public School Permanent Endowment Fund along with any earnings on the proceeds?".

Legislative Council's Statement of Purpose / Fiscal Impact

A joint resolution proposing an amendment to Section 4, Article IX of the Idaho Constitution, relating to the public school fund. To change the name of the fund to "Public School Permanent Endowment Fund." To provide that the fund shall consist of proceeds from the sale of school lands and amounts allocated from the earnings reserve fund and that they be deposited into a Land Bank fund. [There would be] no fiscal impact.

Appendix Table B-1. Legislative Council's Statements FOR and AGAINST the Proposed Amendment to Section 4, Article IX, Constitution of the State of Idaho

Statements FOR the Amendment	Statements AGAINST the Amendment
1. Changing the name of the Public School Fund to the Public School Permanent Endowment Fund clarifies the distinction between this fund and other funds related to public schools. It also makes the name consistent with the other permanent endowment funds held by the state.	1. Changing the name of the Public School Fund to the Public School Permanent Endowment Fund is unnecessary. People who deal with the public school endowment already know what the name refers to.
2. The amendment clarifies the source of money for the Public School Permanent Endowment Fund.	2. Requiring that the Public School Permanent Endowment Fund contain proceeds from the sale of lands of the public school endowment is unnecessary because those proceeds already have to be deposited into the permanent fund of the public school endowment.
3. The amendment makes it easier for the state to buy land that will produce more money for public schools. It will not cause a sell-off of that land. The state maintains nine endowments, with public schools being the largest. Since becoming a state in 1890, Idaho has had the authority to sell endowment land to raise money for the endowment designated for that land. The state has sold over one-million acres since then. However, even with the amendment, long-standing restrictions on the disposal of endowment land apply, such as the restriction in the Idaho constitution that no more than 100 sections (64,000 acres) of endowment land can be sold per year.	3. The amendment will promote a sell-off of public school endowment lands by eliminating the need for land exchanges and allowing sale and purchase transactions between the state and private parties. Such a sell-off will reduce the land base on which Idaho public schools rely for investment income. The state should not be in the business of buying and selling land.

– Appendix Table B-1 continued on next page –

– Appendix Table B-1 continued from previous page –

4. The amendment will result in more money for public schools by giving the state an alternative to the current, inefficient requirement that land exchanges must be performed to acquire land for the public school endowment. Using the Land Bank Fund referred to in the amendment, the state will be able to hold, for a limited time, the proceeds of a sale of public school endowment land for later purchase of replacement land that will be more valuable and will produce more income for public schools.	4. Although the state constitution limits land sales to no more than 100 sections (64,000 acres) of state land per year, this amendment makes it easier for the state to reach that limit, which could result in a reduction of the physical assets of the public school endowment. The requirement that state endowment land can only be exchanged for other land is necessary to prevent depletion of the land base.
5. Proceeds from the sale of public school endowment land, if deposited in the Land Bank Fund, will still be invested and will earn income while in that fund. If that money is not used to buy land for public schools within a certain amount of time, the money and its earnings will be returned to the Public School Permanent Endowment Fund for long-term investment.	5. Allowing money to be held in the Land Bank Fund, even for a limited time, will divert investment money from the Public School Permanent Endowment Fund. The diversion will result in lower revenues for public schools. Money held in the Land Bank Fund will not earn as much money because of the short amount of time it will be held.
6. Land owners who want to dispose of land are more often interested in selling their land for cash rather than in exchanging it for other land. Because money will be available in the Land Bank Fund for the state to buy land for the public school endowment, the pool of willing sellers and available properties should increase, making it easier for the state to buy more valuable replacement land that will produce more income for public schools.	6. The amendment will allow the Land Board to sell off large tracts of land in southern Idaho that are now open for public camping, hunting, fishing and other recreational activities. Large corporate ranchers may benefit from the amendment by buying up public lands, reducing the amount of state-owned land accessible to the public.

House Joint Resolution No. 8, Idaho Legislature 1998

"Shall Section 3, Article IX, and Section 11, Article IX, of the Constitution of the State of Idaho be amended as follows:

1. To change the name of the Public School Fund to the Public School Permanent Endowment Fund;
2. To provide that the earnings of that fund shall be deposited into the Public School Earnings Reserve Fund and distributed in the maintenance of the schools and among the counties and school districts of the state;
3. To provide that no part of the Public School Permanent Endowment Fund principal shall be transferred, used or appropriated to any other fund;
4. To prohibit legislative appropriations from the funds except that the legislature may appropriate moneys from the Public School Earnings Reserve Fund to pay for administrative costs incurred managing the assets of the public school endowment including, but not limited to, real property and monetary assets;
5. To provide that the state treasurer is the custodian of these funds;
6. To provide that the state shall supply losses incurred by the Public School Permanent Endowment Fund, excepting losses on moneys allocated from the Public School Earnings Reserve Fund; and
7. To provide that permanent endowment funds may be invested, rather than loaned, in investments in which a trustee is authorized to invest pursuant to state law?".

Legislative Council's Statement on Effect of Adoption of the amendment to Section 3, Article IX:

The proposed amendment would change the name of the Public School Fund. The earnings of that fund would be deposited into the Public School Earnings Reserve Fund and distributed as required. The principal of the Public School Permanent Endowment Fund would be protected. The principal in that fund could never be transferred to another fund. The state legislature would be prohibited from appropriating money from the Public School Permanent Endowment Fund and the Public School Earnings Reserve Fund.

However, the legislature would have the authority to appropriate money from the Public School Earnings Reserve Fund to pay for the administrative costs incurred in managing the fiscal and real property assets of the public school endowment. The state treasurer continues as the custodian of the described funds. The state would continue to be required to repay losses incurred by the Public School Permanent Endowment Fund, but not losses on moneys allocated from the Public School Earnings Reserve Fund.

Appendix Table B-2. Legislative Council's Statements FOR and AGAINST the Proposed Amendment to Section 3, Article IX, Constitution of the State of Idaho

Statements FOR the Amendment	Statements AGAINST the Amendment
1. Changing the name of the Public School Fund to the Public School Permanent Endowment Fund will promote accuracy and efficiency by clarifying the distinction between this fund and the other funds related to the public school endowment.	1. Changing the name of the Public School Fund to the Public School Permanent Endowment Fund is unnecessary. People who deal with the public school endowment already know what this fund name refers to.
2. Creating a Public School Earnings Reserve Fund will provide a mechanism that is necessary to enable the state to use excess earnings in high investment income years to protect the endowments in low-income years. The fund will act as a shock absorber for fluctuations in the investment market. Because it is flexible, the fund will provide predictability and consistency in the amount of money distributed annually to public schools without invading the fund principal. Also, it will help balance the trustee's obligation to provide for present and future beneficiaries of the endowment, Idaho's public schools.	2. Creating a Public School Earnings Reserve Fund will divert money from the Public School Permanent Endowment Fund and would expose the money in the earnings reserve fund to greater volatility due to investments, losses and appropriations.
3. Limiting legislative appropriation from the Public School Earnings Reserve Fund to pay for administrative costs is necessary to protect the fund, which the legislature could access and use for other purposes. Further, paying administrative costs from the assets of the endowment will allow the public school endowment to be largely self-supporting. This will promote a close control of costs because performance measurement, primarily through financial assets, would include the cost of operations.	3. Limiting legislative appropriation from the Public School Earnings Reserve Fund for administrative costs wrongly restricts the appropriation power of the legislature and shifts some of that power to the executive branch of state government. This restriction is a violation of the separation of powers doctrine. Further, merely allowing appropriations for administrative costs does not guarantee that the public school endowment will be self-supporting. Therefore, the gains sought by this amendment are not only wrong, they will be ineffective.
4. The state is currently required to make up losses incurred by the Public School Fund. The proposed amendment merely clarifies that losses would be required to be paid for by the state if losses are incurred by the Public School Permanent Endowment Fund. The amendment clarifies that the definition of losses would be provided by law. Also, the amendment clarifies that losses on moneys from the Public School Earnings Reserve Fund would be excluded from the loss provision. This exclusion would help protect the Public School Earnings Reserve Fund from being depleted.	4. The state constitution clearly requires that the state must make up losses in the Public School Fund. No more clarification is needed. The proposed amendment might do more harm than good to the endowments because it excludes losses on moneys from the Public School Earnings Reserve Fund. Money lost from any aspect of the endowment should be made up by the state.

Legislative Council's Statement on Effect of Adoption of Proposed Amendment to Section 11, Article IX:

The state would be allowed to invest permanent endowment funds in a broad range of investments as a trustee normally would be allowed to invest the moneys pursuant to state law.

Appedix Table B-3. Legislative Council's Statements FOR and AGAINST the Proposed Amendment to Section 11, Article IX, Constitution of the State of Idaho

Statements FOR the Amendment	Statements AGAINST the Amendment
1. Currently, the state constitution only allows money in Permanent Endowment Funds to be "loaned." In other words, the money can be invested only in instruments that carry a promise of full repayment. Primarily, this means investment in government bonds. This narrow investment requirement has cost endowment beneficiaries dearly. For example, had this amendment been in effect just ten years ago, the endowments would be worth nearly two hundred million dollars more today.	1. The amendment would allow permanent endowment funds to be invested, rather than loaned. This will expose the state to greater financial risks which might produce greater revenue for the endowments, but which also could cause big losses. The endowment funds are too important to be invested in anything but very safe investment instruments, such as government bonds.
2. The current investment restrictions are over 100 years old and do not follow modern business practices. Loosening the investment restrictions will provide the state with the ability to engage in up-to-date investment strategies and policies, and will enable it to diversify its portfolio and receive higher rates of return. A portfolio must be diversified to ensure its safety. Greater investment flexibility is important to the long-term health of the endowment funds.	2. The current investment restrictions have been in place for a long time and have served the state well. The financial assets of the endowments have been invested cautiously for over 100 years and are still making money. Change is unnecessary and may be harmful.
3. This section of the state constitution was amended in 1968 in an attempt to accomplish the same goal that the present amendment would accomplish. The 1968 amendment was approved by the people of the state of Idaho, but a restrictive interpretation by the Idaho Supreme Court nullified the changes that were made. The proposed amendment merely hopes to move beyond that restrictive interpretation.	3. The courts have interpreted this section of the state constitution narrowly because they understand the important nature of the endowment funds and that these funds must be handled with respect and caution. The state has a fiduciary duty to the present and future beneficiaries of the endowments. Opening the funds to investment in a broader range of investment vehicles could endanger the funds, the state and the endowment beneficiaries. This kind of endangerment would be a breach of the state's fiduciary duty.

Appendix C. Idaho Statutes Related to Endowment Fund "Reform" Issues.

TITLE 58 – PUBLIC LANDS
CHAPTER 3 – APPRAISEMENT, LEASE, AND SALE OF LANDS

58-301. APPRAISEMENT -- FEE -- REAPPRAISEMENT -- APPROPRIATION FOR APPRAISEMENT. The board may cause all lands belonging to the state to be appraised, at such times, in such manner and by such means as the board shall decide, and may require the actual cost of an appraisal to be collected from the purchaser at the time of the sale, in addition to the sum bid for the land. All appraisements are under the control of the board, which may approve or disapprove of the same, in whole or in part, and may, at any time, direct a reappraisement or new appraisement to be made: provided further, that the board may require the person or persons seeking such land to be appraised to pay such fee in advance; and when the land shall be thereafter sold, if the purchaser be other than the party seeking such appraisement the sum or sums or the due proportion thereof so advanced by the party seeking such appraisement s*hall be returned to the party paying the same.

58-304. LEASES. The state board of land commissioners may lease any portion of the state land at a rental amount fixed and determined by the board. The rental amount shall be due and payable by the date and upon the terms set by the board in the lease. Provided however, all grazing leases shall provide for annual payments which shall be due and payable by the date set by the board in the lease, but in no case shall the rental for grazing leases be due and payable earlier than January 1 or later than May 1 of each succeeding year.

(2) The state board of land commissioners shall notify the lessee of any increase in the applicable rental rate six (6) months in advance of the date the rent is due and payable.

(3) The lessee shall pay the rental to the director of the department of lands, who shall receipt for the same in the name of the board. Upon receiving such rental, the director shall immediately transmit the same to the state treasurer.

58-313. SALE OF STATE LAND. The state board of land commissioners may at any time direct the sale of any state lands, in such parcels as they shall deem for the best interests of the state. All sales of state lands shall be advertised in four (4) consecutive issues of some weekly newspaper in the county in which the land is situated, if there be such paper, if not, then in some newspaper published in an adjoining county, and in such other paper or papers as the board may direct. The advertisement shall state the time, place and terms of sale, a description of the land and value of the improvements, if any, thereon, and the minimum price per acre of each parcel as fixed by the board, below which no bid shall be received: provided, that sales of state lands shall only be made to citizens of the United States and to those who shall have declared their intentions to become such. If the required sum be not paid forthwith by the highest bidder any lands upon which such payment shall not be made may be immediately reoffered at public sale as before. If any land be sold on which surface improvements have been made by a lessee, or by a former purchaser whose certificate of purchase has for any reason been canceled, said improvements shall be appraised under the direction of the state board of land commissioners. When lands on which improvements have been made, as above, are sold, the purchaser, if other than the owner or former owner of said improvements, shall pay the appraised value of said improvements to the owner thereof, or to the former purchaser who placed the same thereon, taking a receipt therefor, and shall deposit such receipt with the state board of land commissioners before he shall be entitled to a certificate of purchase or patent of said land: provided, the lessee or former owner is not indebted to the state for delinquent rentals or instalment payments on said land. If he is indebted to the state, the value of the improvements shall be credited on his indebtedness and the surplus, if any, be paid to him. All such receipts shall be filed and preserved in the office of said board: provided, that no school lands shall be sold for less than their appraised value nor for less than ten dollars ($10.00) per acre; provided, further, that in the case of the sale of land leased as grazing land and which is too rough, rocky or steep to be reclassified as farming land, the lessee, if he is not the successful bidder, shall be entitled to continue in possession under the lease for a period of two (2) years from the first day of December next occurring after the date of sale at public auction of said land or until expiration of the lease, whichever period shall be shorter.

During such period, all rental earned shall belong to the purchaser subject to the following provisions:

(1) If the land is sold upon instalment contract to the purchaser, the lessee shall continue to make rental payments to the director of the department of lands and the amount of rental earned after the date of sale shall, when received, be applied against and reduce the principal or interest, or both, payable by the purchaser;

(2) If the purchaser pays the purchase price in full, all rentals earned after the date of sale shall be paid directly to the purchaser. However, no lessee of state lands shall have any right to remain in possession under his lease upon the sale of such state lands for home or cabin site purposes, as provided by the regulations of the state board of land commissioners.

58-334. COSTS OF SALE AND TRANSFER. All costs of sale and of transferring property pursuant to such sale, including advertising, abstract fees and/or title insurance premiums, shall be borne by the purchaser, or in case of negotiated sale, transfer or exchange, shall be borne by the agency or person acquiring title to the property as a result thereof.

58-335. LANDS EXEMPT FROM ACT. This act shall not be construed as applying to any lands or properties acquired under the act of congress, known as the Idaho Admission Act, or in the subsequent operations of the various endowment funds of the state. Nor shall this act apply to any lands or properties in the custody of the board of regents of the University of Idaho in its corporate capacity: provided, however, that the board of regents, desiring to avail itself of the facilities of this act, for the sale, exchange or transfer of any such properties, may proceed to negotiate a sale, transfer or exchange with the state board of land commissioners as would any other tax-supported agency.

Appendix D. Land Classification Policy, Idaho State Board of Land Commissioners.

SUBJECT: Land Classification Policy

AUTHORITY: Article IX, Section 8, Idaho Constitution; Idaho Code § 58-132

DISCUSSION: As trustee of state endowment lands, the State Board of Land Commissioners is charged with managing endowment lands "... in such manner as will secure the maximum long term financial return" to the beneficiary institution. The Board is granted full authority and broad discretion to exercise this responsibility. The Land Board is also authorized to designate the best uses of state land, pursuant to Idaho Code § 58-132.

It is clear that, while endowment lands are not to be managed as multiple-use lands, in the traditional federal land sense, they can support competing uses. The decision as to which use is appropriate to meet the constitutional mission, and which other uses may be compatible, is within the broad discretion of the Board.

In order to guide the Board and the Department in making decisions about the appropriate use of endowment land, we propose the following policy:

Regarding determining appropriate uses of endowment land, and in recognition of the constitutional mandate to manage these lands "in such manner as will secure the maximum long term financial return to the institution to which granted," the State Board of Land Commissioners hereby adopts the following policy:

1. The Department of Lands shall designate the primary use of state endowment land based on data and information deemed appropriate by the Department.
2. That endowment land shall be managed in accordance with the designated primary use; i.e. timber land will be managed for timber production, cottage site land will be managed by cottage sites; grazing land will be managed for forage production and livestock grazing, etc.
3. Other uses will be allowed if, in the opinion of the Department, the other use is compatible with and will not unreasonably restrict the designated primary use.
4. Any party may petition the Department to change the designated primary use of endowment land. The petition shall detail the reasons such charge would be in the best long-term interest of the endowed institution. The Department will consider such petition, along with supplementary information the Department deems appropriate, and revise the designation, if it believes such redesignation is in the best interest of the beneficiary institution.
5. During the period a petition for redesignation is under consideration, the use of the designated endowment land will continue based on the designated primary use.
6. The Board may review any land use designations, or changes in designation, and may reserve unto itself, final decisions upon such designations.

RECOMMENDATION: That the Board adopt the above policy and direct the Department to make land management decisions accordingly.

BOARD ACTION: Approved March 13, 2001

Appendix E. Guidelines for Financial Performance Measures from the Citizens' Committee (2001) report to the Land Board.

First, a key provision of an investment policy, and one that has extensive ramifications, is the ***performance objective*** of the Land Trust. This objective drives all investment and management decisions. Currently, there is no investment objective for the Land Trust.

As a starting point for your considerations, we have inserted a 6% real return objective. This ***target real rate of return*** (the return after subtracting inflation) is the real rate of return objective for most pension fund real estate programs. It is also the target return for many timberland programs, including the California Public Employee Retirement System (CalPERS) timberland program. It also happens to be a return number that is generally consistent with (or neutral to) the Endowment Fund Investment Board's asset allocation expected real return, and would not set up any artificial bias in favor of placing assets in the financial trust.

THIS TARGET NUMBER HAS SIGNIFICANT AND MATERIAL IMPACTS. The reason it does is that, under standard appraisal practice (which the Land Board has already adopted as its standard), where there are no recent comparable sales, a discounted cash flow method (or "income capitalization") approach is to be used. (A third method—the "cost" approach—is generally inapplicable to non-commercial lands). Since most of the lands in the trust have few, if any, recent comparable sales data, this is the method that will be generally used under standard industry practice and existing Land Board policy.

A discounted cash flow or income capitalization approach requires a discount rate—one that is consistent with the performance objective of the investment program. Thus, most valuations of the Land Trust will be driven by the selection of the performance objective. And, of course, all investment and asset management decisions are driven by current and expected valuations and cash flows.

As an example of the impact of this decision, the committee measured the performance of the Land Trust and the general resulting land valuations of the Trust using the 6% real rate of return. The committee included these numbers in the **proposed format for a comprehensive summary performance report** that could be used by the Land Board in reviewing the Land Trust, the Financial Trust, and the entire endowment as a whole [Committee Recommendation #2]. These sample format reports have been previously distributed and reviewed with Land Board staff assistants, the Department of Lands, and the Endowment Fund Investment Board staff.

Finally, throughout our committee's discussions there has been a concern that with these policies, reporting metrics, and investment plans there might be an implication that land assets failing to meet a targeted rate of return should be converted to the financial trust, which is another way of saying, "dispose of the land." However, disposition of any land asset under unconstitutionally imposed requirements and the likelihood, in most cases, of non-competitive sales at auction really necessitates a careful look at another viable option, namely, taking the steps necessary to realize the targeted rate of return on certain land assets. Clearly, these decisions will prepresent significant and very sensitive investment choices for the Land Board in the future

Source: Citizen's Committee (2001) report to the Land Board (emphasis in original).

Appendix E (continued). Investment Goals for Idaho Endowment Lands from the Citizens' Committee (2001) report to the Land Board.

General Objective: Trust lands will be managed to secure maximum long-term financial returns to the endow-ment without causing significant long-term adverse impacts to the land or related resources.

Performance Objectives: Trust lands will be managed with the objective of exceeding a minimum target real rate of return of 6.0% and exceeding the relevant National Council of Real Estate Investment Fiduciaries Index ("NCREIF Index"), if available, while maintaining an appropriate level of risk.

Investment Holding Period/Dispositions: The target holding period for assets shall generally be for long-term investment (10 years or more). However, disposition of individual tracts may be triggered by an opportunity to capture a return in excess of the targeted return, or by a revised investment strategy resulting from changes in markets or changes in the Endowment's financial objectives.

Valuation of Lands and Returns: Land valuations and returns will be calculated with the methods used by the NCREIF Index. For timber, grazing, and mineral lands the valuation formula is generally as follows:

Income Return

$$\frac{I_t}{MV_{t-1} + 0.5\,(CI_t - PS_t + PP_t - I_t)}$$

Capital Return

$$\frac{MV_t - MV_{t-1} - CI_t + PS_t - I_t}{MV_{t-1} + 0.5\,(CI_t - PS_t + PP_t - I_t)}$$

Where:

I_t = net operating income obtained from land during quarter t
CI_t = capitalized expenditure on land during quarter t
PS_t = net proceeds from sales of land during quarter t
PP_t = gross costs of adding land during quarter t
MV_t = market value of land a t end of quarter t

Market value will generally be determined using the principles set forth in the Real Estate Investment Standards and as set forth in the Uniform Standards of Professional Practice of the Appraisal Foundation:

The most probable price which a property should bring in a competitive and open market under all conditions requisite to a fair sale, the buyer and seller each acting prudently and knowledgeable, and assuming the price is not affected by undue stimulus. Implicit in this definition is the consummation of a sale as of a specified date and the passing of title from seller to buyer under conditions whereby:

1. buyer and seller are typically motivated;
2. both parties are well informed or well advised, and acting in what they consider their best interests;
3. a reasonable time is allowed for exposure in the open market;
4. payment is made in terms of cash in United States dollars or in terms of financial arrangements comparable thereto; and
5. the price represents the normal consideration for the property sold unaffected by special or creative financing or sales concessions granted by anyone associated with the sale.

These standards will generally be followed, except that

a) The standards of the relevant industry in appraising land shall be followed where there are differences between the standards and industry practices, and
b) The Discounted Cash Flow method of appraisal should be favored where there are significant difficulties in determining a most probable price in an open and competitive market. The discount rate should be consistent with the minimum target rate of return under the Performance Objectives for the land, unless there are demonstrably better alternatives under the circumstances

Source: Citizens' Committee (2001) report to the Land Board (Appendix C therein).

Appendix F. U.S. Forest Service Grazing Land Appraisal Methods

2.2 - GRAZING LAND AND RANCHES. In appraising grazing land, first consider grazing capacity, the capability of the land to support livestock satisfactorily on a long-term basis. Range condition, season of use, class and kind of livestock, suitability for grazing, system of management, adequacy of range improvements, productivity of the land, and similar items are all important elements that affect grazing capacity. The value of grazing capacity depends mainly on the demand for it.

To compare values of grazing lands, it often is necessary to reduce sales transactions and the subject to a common denominator such as animal unit. Conversion factors may vary depending on the locality, age, and size of animals involved, and other considerations.

Recognize that in many areas, the rate of return on some ranch investments is less than interest on bonds, stocks, or savings accounts. For some owners ranching provides a tax advantage; for others it may be the only way of life that appeals to them. Where such market conditions exist, do not rely on the income approach; the direct sales comparison approach is most valid.

2.21 - Appraisal Approaches and Methods.

2.21a - Direct Sales Comparison Approach. Determine grazing capacity by applying the same criteria used on similar private lands.

2.21b - Cost Approach. Estimate land value through comparable land sales and then add the depreciated replacement value of the improvements to arrive at the total value. Adjust for improvements on the basis of improvement costs per acre, per animal unit, or as a lump sum. Adjustments for improvements per acre or animal unit factor out any size differences in the properties being compared. Make lump sum adjustments if all other factors are similar.

2.21c - Income Approach. Develop the income or earnings approach based on (1) land rental or (2) owner-operator earnings analysis.

2.21d - Animal Unit Method. Either the market data or cost approach may be used to implement the animal unit method. The term "animal unit" refers to the investment made to support one animal for a specific time (usually one cow for one year). Use the animal unit method to estimate the value of large units that involve valuable improvements, leases, and other conditions that are difficult to factor out.

2.22 - Effect of Leases. Subtract the leasehold effect or value from the sale price to find the value attributable to the land involved in the sale when using comparable sales in a direct sales comparison approach.

Grazing privileges or leases on Government land have value in the private market even though the Government does not recognize their sale.

Do not use ranch sales that involve one or more types of leases in appraising lands for Forest Service purposes without adjustment for the leases. Often, buyers and sellers specify the amount that the leases or grazing permits contributed to the sale price. Deduct those amounts from the sale price to derive the price of the real estate.

Abstract the values of the leases from the sale prices by using prevailing prices paid for the sale of animal unit months in other ranch and grazing lands transactions.

Source: *Forest Service Handbook* (USDA Forest Service 1992)

Appendix G. Questions on Grazing Lands, Including Potential Non-Financial Values

by Kathy Ewert, Idaho State Controller's Office

There has been little progress in how to assess criteria for opportunity costs or non-financial values of endowment land management. A means to create market value proxies for these non-financial values inherent in endowment land management lies in identifying those assets, prioritize their value and assigning a numeric value to each which may be consistently and fairly applied to each decision, sale, or lease, whether positive, negative or neutral in their impact.

According to the Idaho Supreme Court, the Idaho State Board of Land Commissioners are the sole and exclusive judges in matters of policy, expediency and the business interests of the state regarding management of state endowment lands so long as they do not rum counter to the provisions of the constitution and statutes. With this latitude the Land Board, as the decision makers for Idaho endowment lands, need to define non-financial values by considering some of the following questions and issues to go beyond today's political and managerial stumbling blocks. (These specifically address grazing leases but may apply generically to any endowment land decision.)

A. What cumulative long-term gains are possible with a sale or lease decision for the endowment beneficiaries?

B. What are the cumulative gains / losses and do they promote benefits directly attributable to the endowment beneficiaries?

   1. Premium Bid.
   2. Annual Rent.
   3. Physical improvement(s) on the land (as documented by the lessee or IDL staff).
   4. Administrative and management costs including monitoring, record keeping, and implementation of sales and lease terms.
   5. Stewardship of the land:
      a. Forage levels at selected monitoring intervals or seasons,
      b. Condition of riparian areas,
      c. Water quality in surface waterways,
      d. Health of other vegetation, and
      e. Soil conservation
   6. Adjacent land utilization:
      a. Access to other private or public lands,
      b. Facilitation of neighboring land-use activities, and
      c. Co-habitation of lease activities with neighboring land uses.
   7. Local economic assistance:
      a. Promotion of other factors of local economy that directly or indirectly enhances the benefits of the endowment beneficiaries, and
      b. Promotion of long-term benefits in local economy.

C. How to evaluate these opportunity costs or access a monetary or numeric valued score to each?

   1. Assign numeric values ranking these gains from 1 to10 or as "poor = 1," "good = 2," or "excellent = 3" and/or convert to a dollar value for cumulative financial assessment.
   2. Use documented receipts and/or costs or field studies with defined appropriate windows of time to monitor a lease and access the non-financial values.

D. Establish a target rate for the cumulative sum of these opportunity costs.

Source: personal communication, Kathy Ewert, Idaho State Controller's Office, July 2001.

References Cited

Agee, D.E. 1972. Rates of return to investment for western cattle ranches. *Journal of the American Society of Farm Managers and Rural Appraisers* 36:53-58.

Agland Investment Services (AIS). 2000. *Trust Performance Measurement.* A report to the Western States Land Commissioners Association. Agland Investment Services, Larkspur, CA. Available [online]: <http://www.wslca.org/contents/MeetingsResolutionsMinutes/Trust%20Performance%20Report-Final%20Report.pdf> [9 Aug. 2001].

Alder, L. 2001. Writers on the Range: "Pressure from growth in the West forces more balanced use of State lands." *Idaho Statesman*, Boise, Sept. 5.

Amacher, G.S., R.J. Brazee, and T.A. Thomson. 1991. The effect of property taxes on timber stand investment and rotation length. *Forest Science* 37:1099-1118.

Appraisal Institute. 1992. *The Appraisal of Real Estate*, 10th ed. Appraisal Institute, Chicago, IL.

Baldwin, P., and B. Cody. 1996. Survey of grazing programs in western states. Congressional Research Service, Washington, DC. Available [online]: <http://www.cnie.org/nle/ag-12.html> [17 Aug. 2001].

Barlowe, R. 1978. *Land Resource Economics: The Economics of Real Estate*, 3rd ed. Prentice-Hall, Englewood Cliffs, NJ.

Bartlett, E.T. 1984. Estimating benefits of range for wildland management and planning. In, *Valuation of Wildland Resource Benefits*, G.H. Peterson and A. Randall, eds., pp. 143-155. Westview, Boulder, CO.

_____, N.R. Rimbey, L.A. Torell, L.W. Van Tassell, J. Devilbiss, R. Appel, T. Heisler, G. Stoebig, T. Bagwell, P. Burgener, and J. Coen. 1993. The federal grazing fee: 1993, Part I. In, *Incentive-based Grazing Fee System for Public Rangeland Administered by the Bureau of Land Management and the United States Forest Service.* USDI-BLM/USDA-USFS, Washington, DC.

_____, L.A. Torell, N.R. Rimbey, L.W. Van Tassell, and D.W. McCollum. 2001. Valuing public land forage. *Journal of Range Management* 56 (in press).

Berck, P. 1979. The economics of timber: a renewable resource in the long run. *Bell Journal of Economics* 10(2):447-462.

Binkley, C.S., C.F. Raper, and C.L. Washburn.1996. Institutional ownership of U.S. timberland: history, rationale, and implications for forest management. *Journal of Forestry* 94(9):21-28.

Brokken, R.F., and B.A. McCarl. 1987. A theoretical evaluation of fee systems for private grazing on federal lands. Report No. 570. U.S. Department of Agriculture, Economic Research Service, Washington, DC.

Bromley, D.W. 1984. Discussion of "The role of economic analysis in public range management." In, *Developing Strategies for Rangeland Management.* National Research Council/National Academy of Sciences, pp. 1467-1474. Westview, Boulder, CO.

Brown, M.J., and D.C. Chojnacky. 1996. Idaho's forests, 1991. Resource Bulletin INT-RB-88, USDA Forest Service, Ogden, UT.

Bullard, S.H., and T.J. Straka. 1998. *Basic Concepts in Forest Valuation and Investment Analysis*, 2nd ed. Preceda, Auburn, AL.

California Public Employees' Retirement System (CalPERS). 2000. Statement of investment policy for timber real estate. Available [online]: <http://www.calpers.ca.gov/invest/policies/pdfs/timber%2Dreal%2Destate. pdf> [3 Aug. 2001].

Caulfield, J.P., and D.H. Newman. 1999. Dealing with timberland investment risk: theory versus practice for institutional owners. *Journal of Forest Economics* 5(2):253-268.

Chojnacky, D.C. 1995. Southern Idaho's forest land outside national forests, 1991. Resource Bulletin INT-RB-82, USDA Forest Service, Ogden, UT.

Citizens' Committee. 2001. Citizens' Ad Hoc Evaluation Committee on Lands / Endowment Report. Prepared for the Idaho State Board of Land Commissioners. Available [online]: <http://www2.state.id.us/lands/LandBoard/preliminary_report.htm> [3 Aug. 2001].

Cody, B.A. 1996. Grazing fees: an overview. Congressional Research Service, Washington, DC. Available [Online]: <http://www.cnie.org/nle/ag-5.html> [17 August 2001].

_____, and P. Baldwin. 1998. Grazing fees and rangeland management, part II. Congressional Research Service, Washington, DC. Available [online]: <http://www.cnie.org/nle/ag-17a.html> [17 August 2001].

Collins, A.R., and F.H. Obermiller. 1992. Interdependence between public and private forage markets. *Journal of Range Management* 45(2):183-188.

Cook, P.S., and J. O'Laughlin. 1999. Toward sustainable forest management—part I: certification programs. Report no. 18, Idaho Forest, Wildlife and Range Policy Analysis Group, University of Idaho, Moscow.

_____. 2000. Toward sustainable forest management—part II: the role and effects of timber harvesting in Idaho. Report no. 19, Idaho Forest, Wildlife and Range Policy Analysis Group, University of Idaho, Moscow.

_____. 2001. Taxing forest property: analysis of alternative methods and impacts in Idaho. Report no. 20, Idaho Forest, Wildlife and Range Policy Analysis Group, University of Idaho, Moscow.

Council on Agricultural Science and Technology. 1974. Livestock grazing on federal lands. *Journal of Range Management* 27(3):174-181.

Darden, T.D., N.R. Rimbey, A.J. Harp, and T.R. Harris. 2001. Regional-level economic impacts of grazing policy changes: a case study from Owyhee County, Idaho. In, *Current Issues in Rangeland Economics*, L.A. Torell, E.T. Bartlett, and R. Larrañaga, eds. New Mexico State University Agricultural Experiment Station Research Report 737, Las Cruses. Pp. 83-92.

Davis, K.P. 1966. *Forest Management*, 2nd ed. McGraw-Hill, New York, NY.

Davis, L.S., and K.N. Johnson. 1987. *Forest Management*, 3rd ed. McGraw-Hill, New York, NY.

Denmark, F. 1999. Timberland grows up. *Plan Sponsor* (May), available [online]: <http:// www.assetpub.com/psmay99/may99PS046_ right. html> [3 Aug. 2001].

Dyer, A.A. 1984. Public natural resource management and valuation of nonmarket outputs. In, *Developing Strategies for Rangeland Management*. National Research Council/National Academy of Sciences, pp. 1559-1611. Westview, Boulder, CO.

Egan, L.M., and M.J. Watts. 1998. Some costs of incomplete property rights with regard to federal grazing permits. *Land Economics* 74(2):171-185.

Ellefson, P.V., A.S. Cheng, and R.J. Moulton. 1997. State forest practice regulatory programs: an approach to implementing ecosystem management on private forest lands in the United States. *Environmental Management* 21(3):421-432.

Faustmann, M. 1849. Calculation of the value which forest land and immature stands possess for forestry. English translation by W. Linnard in M. Gane (ed.), 1968, University of Oxford, Commonwealth Forestry Institute paper 42, "Martin Faustmann and the Evolution of Discounted Cash Flow." Reprint, 1995, *Journal of Forest Economics* 1(1):7-44, available [online]: <http://www. sekon.slu.se/~oca/eng/publ/ journal.pdf> [23 July 2001].

Gardner, B.D. 1984. The role of economic analysis in public range management. In, *Developing Strategies for Rangeland Management*. National Research Council/National Academy of Sciences, pp. 1441-1466. Westview, Boulder, CO.

Godfrey, E.B. 2001. Charging fair market value for using federal lands: some implications of an ignored policy. In, *Current Issues in Rangeland Economics*, L.A. Torell, E.T. Bartlett, and R. Larrañaga, eds. New Mexico State University Agricultural Experiment Station Research Report 737, Las Cruses. Pp. 111-125.

Gorte, R.W. 1998. Federal sales of natural resources: pricing and allocation mechanisms. Congressional Research Service, Washington, DC. Available [online]:<http://www.cnie.org/ nle/nrgen-8.html> [17 Aug. 2001].

Govoni, S.J. 1993. Timber bulls. *Plan Sponsor* (October), available [online]: <http:// www.assetpub.com/archive/ ps/93-09psoct/ oct93PS058.html> [3 Aug. 2001].

Gregory, G.R. 1987. *Resource Economics for Foresters*. John Wiley & Sons, New York, NY.

Hancock Timber Resources Group (HTRG). 2001. "Educate Me: Timberland Investing" and "About HTRG: Philosophy." Available [online]: <http:// www.htrg.com/> [3 Aug. 2001].

Harp, A.J., R.R. Loucks, and J.N. Hawkins. 2000. Spatial distribution of economic change from Idaho ranches. *Journal of Range Management* 53(2):164-169.

Helms, J.A., ed. 1998. *The Dictionary of Forestry*. Society of American Foresters, Bethesda, MD.

Horne, A.L., and R.W. Haynes. 1999. Developing measures of socioeconomic resiliency in the Interior Columbia Basin. Gen Tech. Report PNW-GTR-453, USDA Forest Service, Portland, OR.

Husch, B., C.I. Miller, and T.W. Beers. 1972. *Forest Mensuration*, 2nd ed. Ronald Press, New York, NY.

Idaho Administrative Procedures Act (IDAPA). 2001a. IDAPA 20.03.14 - Grazing Leases and Cropland Leases, Idaho Department of Lands. Available [online]: <http://www2.state.id.us/adm/adminrules/rules/idapa20/0314.pdf> [24 Aug. 2001].

_____. 2001b. IDAPA 35.01.03 – Property Tax Administrative Rules, Dry Grazing Land (130.05) and Property Exempt from Taxation (613.01), Idaho State Tax Commission. Available [online]: <http://www2.state.id.us/adm/adminrules/idapa35/0103.pdf>[24 Aug. 2001].

_____. 2001c. Proposed Rulemaking: Grazing Leases and Cropland Leases, Idaho Department of Lands. *Idaho Administrative Bulletin* 1(10): 521-538, available [online]: <http://www2.state.id.us/adm/adminrules/bulletin/01octvol2.pdf> [13 Dec. 2001].

Idaho Department of Lands (IDL). 2000a. Asset valuation report 2000. Boise, ID.

_____. 2000b. Annua l report 2000. Boise, ID. Available [online]: <http://www2.state.id.us/lands/pdf/IDL_ ANNUAL_RPT2000.pdf> [3 Aug. 2001].

_____. 2000c. Timber harvest, Idaho state endowment lands, 1951-1999. IDL staff, Boise, ID. (2000 harvest level from IDL 2000b).

_____. 2001a. State forest lands. Operations Memorandum 900, with updated acreage from 1999 and 2000 inventories. IDL Staff, Coeur d'Alene, ID.

_____. 2001b. Total by asset type, statement of cash flow, FY 1992-FY2000. IDL staff, Boise, ID.

_____. 2001c. Timber products sold by all types of sales, FY 1989-2001. IDL staff, Coeur d'Alene, ID.

_____. 2001d. Rules governing grazing leases and cropland leases. Agenda item 11, in, Final minutes, regular Land Board meeting, August 7. Available [online]: <http://www2.state.id.us/lands/landboard.htm> [13 Dec. 2001].

_____. 2001e. Grazing fee for calendar year 2001. Agenda item 4, in, Final minutes, regular Land Board meeting, October 9. Available [online]: <http://www2. state.id.us/lands/landboard.htm> [13 Dec. 2001].

_____. 2001f. Annual summary of AUMs/acres/receipts, 1992-2000. IDL staff, Boise, ID.

Klemperer, W.D. 1983. Ambiguities and pitfalls in forest productivity taxation. *Journal of Forestry* 81(1):16-19.

Klemperer, W.D. 1996. *Forest Resource Economics and Finance*. McGraw-Hill, New York, NY.

Martin, W.E., and G.L. Jeffries. 1966. Relating ranch prices and grazing permit values to ranch productivity. *Journal of Farm Economics* 48:233-242.

McKetta, C. 1990. Forest tax tinkering in the intermountain West. *Western Wildlands* (Fall):19-23.

Montana Department of Natural Resources and Conservation (Montana DNRC). 2000. Report on Return on Asset Value by Trust and Land Office for Classified Forest Lands, Fiscal Year 2000. Trust Land Management Division, Helena, MT.

Mosley, J.C., P.S. Cook, A.J. Griffis, and J. O'Laughlin. 1997. Guidelines for managing cattle grazing in riparian areas to protect water quality: review of research and best management practices. Report no. 15, Idaho Forest, Wildlife and Range Policy Analysis Group, University of Idaho, Moscow.

National Research Council (NRC). 2000. A framework for sustainable forest management. In, *Environmental Issues in Pacific Northwest Forest Management*. N.L. Christiansen, Jr., committee chair, pp. 171-198. National Academy Press, Washington, DC.

Norton, D.R. 1997. Performance audit: Arizona State Land Department. Report to the Arizona State Legislature, No. 97-6. Available [online]: <http:// www.auditorgen.state.az.us/PDF/97-6.pdf> [24 Aug. 2001].

Obermiller, F.W., and D.K. Lambert. 1984. Costs incurred by permitees in grazing livestock on public lands in various western states. Report no. EM 8283, Cooperative Extension Service, Oregon State University, Corvallis.

O'Laughlin, J. 1990. Idaho's endowment lands: a matter of sacred trust. Report no. 1, Idaho Forest, Wildlife and Range Policy Analysis Group, University of Idaho, Moscow.

_____, and P.V. Ellefson. 1982. Strategies for corporate ownership and management of timberland. *Journal of Forestry* 80(12):784-788.

_____, and P.S. Cook. 1995. Endangered Species Act at the crossroads: new directions from Idaho case studies. Report no. 13, Idaho Forest, Wildlife and Range Policy Analysis Group, University of Idaho, Moscow.

Quigley, T.M., R.G. Taylor, and R.M. Cawley. 1988. Public resource pricing: an analysis of range policy. Gen. Tech. Report PNW-RB-158, USDA Forest Service, Portland, OR.

Redmond, C.H., and F.W. Cubbage. 1988. Portfolio risk and returns from timber asset investments. *Land Economics* 64:325-337.

Rimbey, N.R., L.A. Torell, T. Bartlett, and L.W. Van Tassell. 1994. Private grazing lease arrangement and their application to market price comparisons. *Journal of the American Society of Farm Managers and Rural Appraisers* 58(1): 125-129.

_____, L. Stodick, T. Darden, C. Gibson, R. Smathers, and C.W. Gray. 1999. Range livestock cost and return estimates: a tool for assessing the economic impacts of policy changes. In, *Grazing Land Economics and Policy*, Proceedings of a Symposium Sponsored by the Western Coordinating Committee on Range Economics WCC-55, E.T. Bartlett and L.W. Van Tassell, eds., pp. 64-69. Colorado Agricultural Experiment Station, Colorado State University, Ft. Collins.

_____, A.J. Harp, and T.D. Darden. 2001. Ranch-level economic impacts of grazing policy changes: a case study from Owyhee County, Idaho. In, *Current Issues in Rangeland Economics*, L.A. Torell, E.T. Bartlett, and R. Larrañaga, eds. New Mexico State University Agricultural Experiment Station Research Report 737, Las Cruses. Pp. 75-81.

Row, C., H.F. Kaiser, and J. Sessions. 1981. Discount rate for long-term Forest Service investments. *Journal of Forestry* 79(6):367-369.

Skamania (1984): *County of Skamania v. State*, 102 Wn.2d 127, 685 P.2d 576 (1984).

Society of American Foresters (SAF). 2001. Timber harvesting on federal lands: an essential tool for sustainable forest management. National Position Statement, available [online]: <http://www.safnet.org/policy/psst/timber.html> [12 December 2001].

Souder, J.A., and S.K. Fairfax. 1996. *State Trust Lands: History, Management and Sustainable Use*. Univ. of Kansas Press, Lawrence.

_____, M. Davis, and J. Mast. 1996. Evaluation of the State Land Commissioner's Range Stewardship Incentive Program, final report. New Mexico State Land Office (cited in AIS 2000).

Spahr, R.W., and M.A. Sunderman. 1998. Property tax inequities on ranch and farm properties. *Land Economics* 74(3):374-389.

Stern, B.S. 1998. Permit value: a hidden key to the public land grazing dispute. Master of Science thesis, University of Montana, Missoula.

Straka, T.J., and S.H. Bullard. 1996. Land expectation value calculation in timberland valuation. *Appraisal Journal* 64(4):399-405.

Sunderman, M.A., and R.W. Spahr. 1994. Valuation of government grazing leases. *Journal of Real Estate Research* 9(2):179-196.

Torell, L.A., and J.P. Doll. 1991. Public land policy and the value of grazing permits. *Western Journal of Agricultural Economics* 16(1):174-184.

_____, and S.A. Bailey. 2000. Is the profit motive an important determinant of grazing land use and rancher motive? Paper presented at the Western Agricultural Economic Association Annual Meeting, Vancouver, British Columbia, June 29 - July 1, 2000. Available [online]: <http://agecon. lib.umn.edu/cgi-bin/pdf_view.pl?paperid=2208> [24 Aug. 2001].

_____, N.R. Rimbey, E.T. Bartlett, L.W. Van Tassell, and J.A. Tanaka. 2001a. An evaluation of the PRIA grazing fee formula. In, *Current Issues in Rangeland Economics*, L.A. Torell, E.T. Bartlett, and R. Larrañaga, eds. New Mexico State University Agricultural Experiment Station Research Report 737, Las Cruses.

_____, _____, J.A. Tanaka, and S.A. Bailey. 2001b. The lack of profit motive for ranching: implications for policy analysis. In, *Current Issues in Rangeland Economics*, L.A. Torell, E.T. Bartlett, and R. Larrañaga, eds. New Mexico State University Agricultural Experiment Station Research Report 737, Las Cruses.

U.S. Dept. of Agriculture - National Agricultural Statistics Service (USDA-NASS). 2001a. Agricultural prices, January 31, 2001. Available [online]: <http://usda.mannlib.cornell.edu/reports/nassr/price/pap-bb/2001/agpr0101. pdf> [21 Aug. 2001]. (Data available back to 1995.)

_____. 2001b. Agricultural land values, August, 2001. Available [online]: <http://usda.mannlib.cornell.edu/reports/nassr/price/pap-bb/2001/land0801.pdf> [15 Oct. 2001].

U.S. Dept. of Agriculture - Forest Service. (USDA Forest Service). 1992. *Forest Service Handbook* 5409.12 - Appraisal Handbook. Available [online]: <http://www.fs.fed.us/im/directives/fsh/5409.12/5409.12,2.txt> [17 Aug. 2001].

_____. 2000. RPA assessment of forest and rangelands 2000. Available [online]: <http://www.fs. fed.us/pl/rpa/rpaasses.pdf> [3 Aug. 2001].

U.S. Dept. of Agriculture - Forest Service. (USDA Forest Service). 2001. Deflated stumpage prices in the contiguous states, by region, 1952-1997, with projections to 2050. Table 3.8 in, RPA 2000 Tim-ber Assessment Draft Review. Available [on-line]: <http://www.fs.fed.us/pnw/sev/rpa/ rpa2000. htm> [3 Aug. 2001].

U.S. General Accounting Office (US-GAO). 2001. BLM and the Forest Service: Federal taxpayers could benefit from more land sales. GAO-01-882, Washington, DC.

Vardaman, J.A. 1989. *How to Make Money Growing Trees*. John Wiley & Sons, New York, NY.

Wagner, J.E., F.W. Cubbage, and C.H. Redmond. 1995. Comparing the capital asset pricing model and capital budgeting techniques for analyzing timber investments. *Forest Products Journal* 45: 69-77.

Washington Department of Natural Resources (Washington DNR). 2001. Economic and revenue forecast, November 2001. Office of Budget and Economics, Olympia, WA. Available [on-line]: <http://www.wa.gov/dnr/htdocs/obe/nov01forecast.pdf> [13 Dec. 2001].

Western States Land Commissioners Association (WSLCA). 2001a. A perpetual legacy: carrying out a mandate as old as the nation. Position paper, available [online]: <http://www.wslca.org/contents/Position_Papers/Perpetual_Legacy.htm> [9 Aug. 2001).

_____. 2001b. An asset management primer. Available [online]: <http://www.wslca.org/contents/MeetingsResolutionsMinutes/Asset%20Management%20Primer.pdf> [9 Aug. 2001].

Weston, J.F., and E.F. Brigham. 1981. *Managerial Finance*, 7th ed. Dryden Press, Hinsdale, IL.

Whitaker, W., R. Hess, and W. McIntosh. 1999. Timberland—an emerging investment alternative. Prudential Real Estate Investors. Available [on-line]: <http://www2.prudential.com/o&s/prei.nsf/14ef712a6b099d9d852566ef005111d0/7e841e516fd4a0e3852567fa004d489b/$FILE/timberland_0999.pdf> [3 Aug. 2001].

Wilson, M.J., and D.D. Van Hooser. 1993. Forest statistics for land outside national forests in northern Idaho, 1991. Resource Bulleting INT-80, USDA Forest Service, Ogden, UT.

Workman, J.P. 1986. *Range Economics*. Macmillan, New York, NY.

Yin, R., J. Caulfield, M.E. Aronow, and T.G. Harris. 1998. Industrial timberland: current situation, holding rationale, and future development. *Forest Products Journal* 48:43-48.

Zinkhan, F.C. 1998. Forestry projects, modern portfolio theory, and discount rate selection. *Southern Journal of Applied Forestry* 12:132-135.

_____, and F.W. Cubbage. 2001. Timber investment analysis, portfolios, and investment vehicles. In, *Forests in a Market Economy*, E. Sills and K. Abt, eds. Kluwer Academic, New York, NY (in press).

_____, W.R. Sizemore, G.H. Mason, and T.J. Ebner. 1992. *Timberland Investments: A Portfolio Perspective*. Timber Press, Portland, OR.